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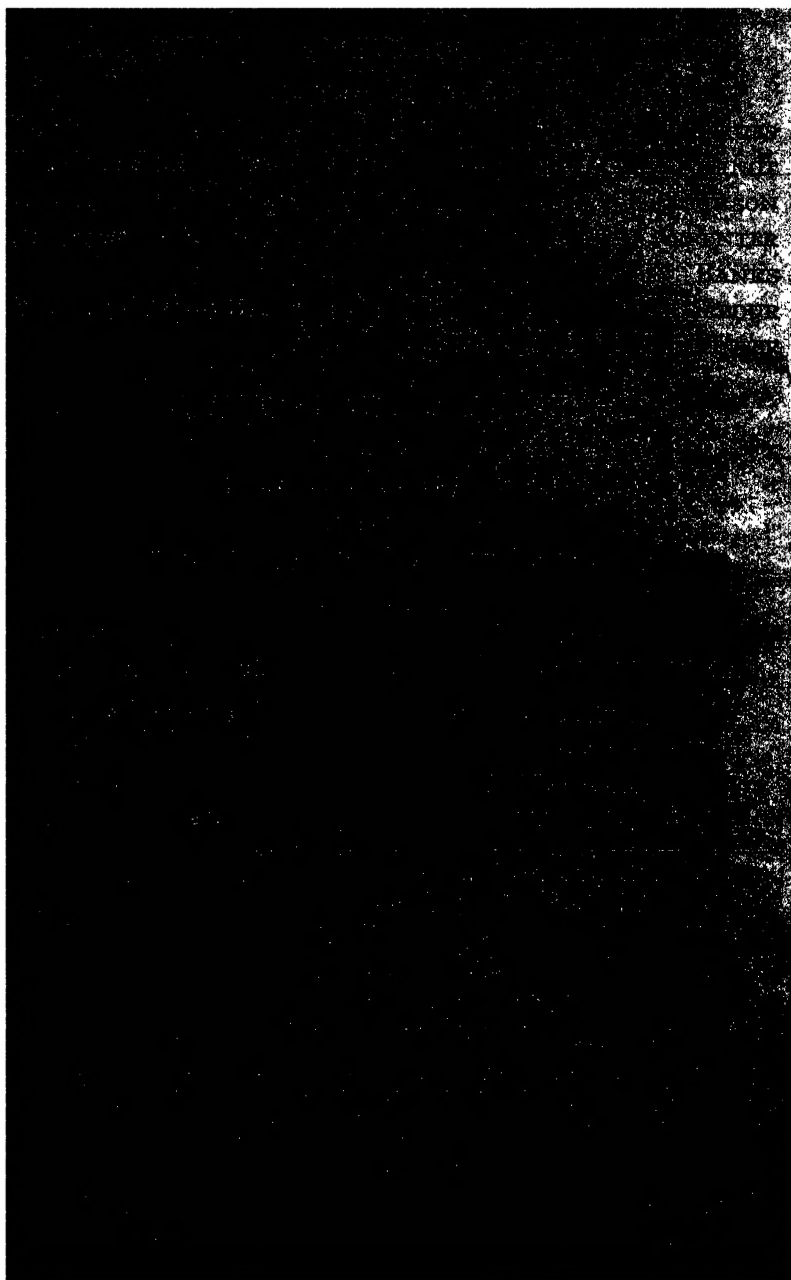
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NOTES ON NEOTROPICAL PLEBEJINÆ (LYCÆNIDÆ, LEPIDOPTERA)¹

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In a recent paper² I briefly listed the only *Plebejinæ* (s.s.) found in the Nearctic region. Subsequently I decided to see whether any true *Plebejinæ* occurred in the neotropics besides the three or four species the genitalia of which I had happened to examine before. The results proved so unexpected and interesting that it seems worth while to publish the present paper despite its rather superficial and incomplete nature.

In order to cover more ground (and, in some cases, owing to the scantiness of the material at hand) only a very small number of specimens (about 120 in all) have been dissected and drawn (after a few *Catochrysopinæ* and representatives of other subfamilies had been weeded out by the same method). Some of these figures are appended. All the specimens, except a few supplied with his usual kindness by Mr. W. P. Comstock of the American Museum of Natural History, are preserved in the Museum of Comparative Zoology, Harvard.

A rather drastic rearrangement of the species and groups was an inevitable consequence of this investigation. Seven new genera have been introduced; two have been revised and restricted. In several cases it was found that forms had been assigned by recent authors to the wrong species. Some syno-

¹ Published with the aid of a grant from the Museum of Comparative Zoology at Harvard College.

² 1944 [Feb 1945] *Psyche* 51: 104-138, where the following errata should be corrected: line 12, p. 105, instead of "*hanno* Stoll" read "*ceraunus* Fabricius (*nom. spec.*)"; line 28, p. 107, instead of the misprint "*calliopsis*" read "*calliops*"; p. 111, in the sentence beginning "A complete sequence . . ." transpose "paleartic" and "nearctic."

nymys have been tracked down, others are tentatively suggested but cannot be finally disposed of until the types are examined (or neotypes fixed). The brief bibliographical references given are merely intended to indicate the identity of the forms discussed. Beyond the inclusion of some random notes on certain phases of pattern, macroscopical characters are not discussed, and no attempt has been made to revise in this respect the (fortunately rather few) races that have received names.

In spite of the work accomplished since 1909, by Tutt and Chapman in England and by Stempffer in France, entomologists in this country employ the term "*Plebejinæ*" simply as a euphemism for the "*Lycæna*" of German authors, or "Blues,"¹ and "*Plebejus*" is used for a number of heterogeneous Nearctic species only one of which (*sæpiolus* Boisduval) belongs structurally to the genus of which the Palearctic *Plebejus argus* Linnæus is the type. In a way the initial blunder was Swinhoe's who while correctly giving a subfamilial ending to the group which Tutt's intuition and Chapman's science had recognized ("tribe" *Plebeidi* which exactly corresponds to the *Plebejinæ* of Stempffer) as different from other "tribes" (i.e., subfamilies) within the *Lycænidæ*, failed to live up to the generic diagnoses which he simply copied from Chapman's notes in Tutt and tried to combine genitalic data he had not verified or did not understand with the obsolete "naked v. hairy eyes" system (which at Butler's hands had resulted in probably the most ludicrous assembly of species ever concocted, see for example Butler 1900, Entom. 33:124), so that in the case of several Indian forms which Chapman had not diagnosed, Swinhoe placed intra-generically allied species in different subfamilies and species belonging to different Tuttian "tribes" in the same subfamily.

In reality the subfamily *Plebejinæ* is extremely well differen-

¹ Thus McDunnough uses "*Plebejinæ*" in his "Check List" of Nearctic Lepidoptera (1938 Mem. S. California Acad. Sci. 1:26), and thus Comstock uses "*Plebejinæ*" in his work on Rhopalocera of Porto Rico and the Virgin Islands (1944, in Miner, Scient. Survey P. R. and V. Isls. 12:492), but the two references the latter author appends (Swinhoe 1910, Lep. Indica 8:10 and Hampson 1918, Novit. Zool. Tring 25:385) are most misleading: the first, because *Syntarucus* Butler, a genus structurally indistinguishable from *Leptotes* Scudder (which is one of the two genera assigned by Comstock to "*Plebejinæ* Swinhoe") is placed by Swinhoe in a different subfamily, namely *Lampidinae* (now known as *Catochrysopinae*), and the second, because Hampson's (perfectly invalid) use of "*Plebejus*" and "*Plebejinæ*" refers to a section of a different family, namely *Erycinidæ* (now known as *Riodinidæ*).

tiated in all its genitalic elements (the ædeagus and its appendages, the tegumen, cingula, falces, uncus lobes and valves of the male, and the cervix bursæ and vaginal armature of the female) from the *Catochrysopinæ* (containing the holotropical *Leptotes* Scudder and a huge array of palæotropical species in several genera), the *Glaucopsychinæ* (containing, among others, the three holarctic genera *Glaucopsyche* Scudder, *Scolitantides* Hübner [to which *Phædrotes* Scudder and "*Shijimia* Matsu-mura" fall as synonyms] and *Philotes* Scudder), the *Evcrinæ* with the holarctic *Everes*, the *Lycænopsinæ* with the holarctic *Celastrina* Tutt (= *Cyaniris* Scudder, *nec* Dalman), *etc.*

The arrangement proposed in the present paper needs to be prefaced by a few words on taxonomic units. The strictly biological meaning forcibly attached by some modern zoologists to the specific concept has crippled the latter by removing the morphological moment to a secondary or still more negligible position, while employing terms, *c.g.*, "potential interbreeding," that might make sense only if an initial morphological approach were presupposed. What I term species, in my department, can be defined as a phase of evolutionary structure, male and female, traversed more or less simultaneously by a number of, consequently, more or less similar organisms morphologically shading into each other in various individual or racial ways, interbreeding in a given area and separated there from sympatric representatives of any other such phase by a structural hiatus with absence of interbreeding between the two sets. In other words: 1. any two structurally indistinguishable individuals belong to the same species regardless of biological, physiological, geographical or any other factors; 2. structurally distinguishable sympatric non-interbreeding sets represent different species regardless of all other considerations; 3. structurally distinguishable sympatric individuals belong to the same species when they occur within an interbreeding set; 4. structurally distinguishable allopatric sets belong to the same species if the hiatus between their structures is completely bridged by intermediate structures in other, not necessarily intermediate, areas; 5. obviously allied but structurally distinguishable allopatric sets not linked by such intergrades can be said to belong to different or the same species only by analogy, *i.e.*, by analysing the structural gaps between sympatric species or individuals possessing the same general type of structure. Conditions 2 and 4 do not

exclude each other and so it may happen that two structurally distinguishable local forms belong to one species allopatrically because they racially intergrade, but at the same time belong to different species sympatrically because in some other region their structural counterparts occur side by side without interbreeding (this incidentally is the position in *Lycæides*). In such cases one should give precedence to the all important sympatric moment and find somewhere in the spirals of racial intergradation a point at which the whole system can be elegantly, in the mathematical sense (for we are dealing with measurable structures), divided into two parts, *i.e.*, two species, using some combination of trinomials to designate this or that interspecific form (*e.g.*, *Lycæides scudderi doci* Roe *trans ad melissa roei* Doe). This state of affairs is not a flaw in the concept of "species" but an indirect result of its dual nature ("structure" plus "reproduction," "male" plus "female" *etc.*) and should be accepted by the taxonomist with perfect equanimity.¹

The impact on the eye of a combination of characters in the whole structure or in an element of it, results in the perception of certain structural types. Structures of the same type imply phylogenetic affinities unless it can be proved, as in some cases it is easy to do, that the resemblance is "false" *i.e.*, attained by essentially different means. Such false resemblances are extremely rare and the number of characters involved is small, and this is as it should be, since such "convergence" depends upon the mathematics of chance. False dissimilarities also occur (and are also rare), *i.e.*, the striking difference between one type and another is seen, when analysed, to be due to a simple and brief process of evolution in an unusual direction.

Unless we believe that certain structural resemblances and dissimilarities are not due to chance or to gross adaptional modifications, but can be classified according to their phylogenetic sense, all horizontal genera are artificial groupings — of some practical use to collectors (*e.g.*, the convenient lumping of all small blue butterflies with rounded hindwings and dotted undersides in one "genus") but of no scientific value. This brings us to the question as to whether a classification on the

¹ "Subspecies" (on which I hold rather special views which I shall discuss elsewhere) may be briefly defined as a locally constant phase of specific alar characters with or without a local fixation of some stage within the graded variational range of the specific genitalic structure. The days are quite gone when easy-going describers could give names to these things without a detailed study of genitalic and pattern characters throughout the polytypic species or genus involved.

basis of genitalia reflects natural relationships better than do other principles. I think the answer is "yes."

A "polytypic genus" is determined by structural characters which are common to all the species it includes and the particular combination of which, more than the presence of some particular detail, no matter how striking, distinguishes the group from any other. A "monotypic genus" (*i.e.*, a structurally isolated species which does not fit into any known generic group) obviously lacks the first feature while the number of characters entering the distinctive combination is vastly increased by practically coinciding with the whole array of specific characters, so that the only "reality" a monotypic genus has, lies in the implication that the only species it contains is the only one "known" and that if others were "known," a common denominator now "hidden" in the monotypic genus would be revealed. Among polytypic genera, a "natural genus" is one which reflects the flickering, as it were, of a strongly differentiated type of combinational structure within limits as narrow *per se* as, say, the range of continuous variation within a structurally highly polytypic species, and thus consists of specific structures resembling each other more than they do any other species. If h_1, h_2, h_3, h_4 denote the interspecific hiatuses, and H_1, H_2 , etc. the intergeneric ones, then the lesser the h 's and the larger the H 's, the more "natural" the genus is — and the more liable it is to be transformed into a polytypic species by the next reviser with more material at his disposal.

A certain harmony, as yet rather obscure, seems to exist between a particular type of male armature and a particular female one; this has been taken into account in founding the genera discussed below. The impression I have formed so far that with "natural genera" specific differentiation in these organs is more marked (or at least easier to observe) in the male may be due to insufficient investigation, but anyway I cannot find any *exact* correlation between female lock and male key. In what manner and to what extent the sclerotized parts of the sexes in *Plebejinæ* fit each other during copulation is not clear, but I doubt whether the most vulnerable part, come into any direct contact with such structures in the female organ that might lead to some intersexual adaptation.¹

¹ Lorkoviz states (1938, Mitt. Münchner Ent. Ges. 28:231) in an admirable paper on the European representatives of *Everes* (*Everinae*) that in that genus

Adaptation to surroundings, to climate, altitude *etc.*, and hence "natural selection" in its simplest sense, certainly had no direct action whatever on the moulding of the genital armature, and we know nothing of the physiological processes of which that elaborate sculpture is the structural overflow. While accepting evolution as a modal formula, I am not satisfied with any of the hypotheses advanced in regard to the way it works; on the other hand, I am quite certain that repetitions of structure, on the Siberian tundra and on the paramos of the Andes, on a mountain in India and on an island in the Caribbean Sea, cannot be treated as a result of haphazard "convergence" since the number of coincident characters in one element, let alone the coincidence of that coincident number with a set of characters in another element, exceeds anything that might be produced by "chance." Hence the conviction that there is *some* phylogenetic link where there is a recurrence of similar genitalic characters and that certain groupings—the new genera to which we now must turn—may be so devised as to reflect the natural affiliations of the species.

Plebejinæ

Stempffer, 1937–1938, Bull. Soc. ent. France 42: 211–218, 296–300; Nabokov, 1944, Psyche 51: 104–105; = *Plebeidi*, *sensu* Tutt [*et* Chapman], 1909, British Butt. 3: 150–159; Chapman, 1910, Ent. Rec. 22: 101–103; 1916 Trans. Ent. Soc. London 1916: 157–180; = "*Plebeius* + *Polyommatus*" *s.* Bethune Baker, 1914, Ent. Rec. 26: 164; *Polyommatinæ*, Forster 1938, Mitt. Münchner ent. Ges. 38: 111–116.

Parachilades n.g.

(fig. 1, figs. TIT, pl. 2,7)

Type and only known species *Lycæna titicaca* Weymer 1890 (*in* Reiss *et* Stübel, Reisen in Süd-America, Lepidoptera :122–123 "Titicaca Lake; Sajama, Bolivia," pl. 4, fig. 6 [very poor]; *Itylos* [*s.l.*] *titicaca*, Draudt, 1921, *in* Seitz, Macrolep. World, 5 :122, pl. 144, m [coarse copy of original fig.]; *Cupido speciosa*

the median uncal projection (a structure not found in *Plebejinæ* and wrongly, in my opinion, regarded as being formed by the fusion of the uncus lobes) fits exactly the vaginal plate of the female, both varying together according to the species. See also Chapman 1916, Trans. Ent. Soc. London 1916:170.

Staudinger, 1894, *Iris* 7 : 77-78, "Huallatani and Quebrada Malaga, Bolivia"; *Lycæna speciosa*, *ibid.*, pl. 2, fig. 8 ♂; *Itylos* [*s.l.*] *speciosa*, Draudt, 1921, *l.c.*, pl. 144, n, figs. ♂ ♀).

Five males and one female investigated: prep. 610, "Titicaca

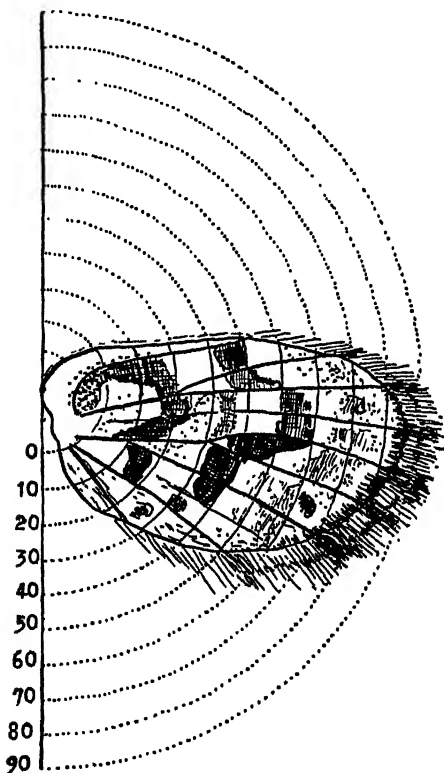


FIG. 1. *Paruchilades titicaca*, left hindwing underside x7.

[Lake], Bolivia," *ex coll.* Huntington [*ex coll.* Staudinger-Bang Haas], *Amer. Mus. Nat. Hist.*; prep. 483, 488, 589, 620, ♀ 590, "Sicasica, Bolivia, 1.X.1899" *ex coll.* Weeks, *Mus. Comp. Zool.*

Ædeagus thickish,¹ about 1 mm. long, the suprazonal portion subequal to the subzonal one. In general type fairly close to

¹ In all genera examined the subzonal portion of the ædeagus appears in cross-section as a dorso-ventrad directed oval, the lengthening of which produces the appearance of "thickness" in the organ when the latter is viewed from the side.

Chilades (see pl. 2, CON 1), still more curved, however, with a pronounced bulging of the outline (in lateral view) dorsally at the zone (above the zone and less conspicuous in *Chilades*) and a somewhat different structure of the suprazonal portion. Suprazonal sheath terminating on the ventral side in a point (which is not notched as it is in *Chilades*) with two filament-like lateral portions (structurally similar to the spine-like single medial process described by Chapman in other genera and represented in *Chilades*¹) diverging from it and rimming the vesica, the erected (everted) frothy membrane of which they seem to prop. Vesical opening (on the dorsal side) beginning just above the zone (thus at a more proximal point than in *Chilades*). Vesica very simple and weak as in *Chilades*, *Freyeria*,² *Lycæides*, etc. Alulæ considerably more developed than in *Chilades*, forming two petals almost 0.3 long and resembling (or representing) rudiments of the peculiar element (sagum) that exists at various degrees of development in several other neotropical genera where, however, it is well differentiated from the alulæ (except in *Hemiargus*). Furca considerably smaller in relation to the ædeagus than in *Chilades*, singularly thick, pincers-like, connected at its tips with the petals of the alulæ. The whole dorsum (falx + uncus lobe + tegumen) remarkably similar in type to *Chilades*, which type is characterised by the breadth of the robust and long forearm exceeding that of the long finger-shaped uncus lobe,³ by the humerulus appearing to be produced (owing to the exiguity of the lobe) not from the base of the lobe but from the tegumen proper, and by the latter being smaller by comparison to the falx and the lobe than in other *Plebejinæ*. Differing from *Chilades* in the greater size of the falx and uncus lobe in relation to the rest of the armature and to the size of the

¹ One wonders whether this medial process in *Chilades* is not, perhaps, merely a lesser stage of development of the pointed part of the sheath of *Parachilades*, while the lateral processes in the latter represent a lesser stage of development in comparison to the latero-ventral pointed sheath portions of *Chilades*. I am not fully satisfied with my observations in regard to the ædeagus of these two genera.

² I fail to find in either of the two species of *Freyeria* (*trochilus* and *putli*) the cornuti mentioned in the case of *trochilus* by Stempffer (1937, Bull. Soc. ent. France 42:215).

³ In fact Fruhstorfer, the only German writing author of his time who made any attempt to follow the British authors in the study of Lycænid genitalia for systematic purposes, in an enthusiastic, but amateurish, and poorly illustrated paper on *Chilades* (1916 Zool. Meded. Leiden, 2:90-95) mistook the uncus lobes of *lajus* and *deotas* for an additional pair of falces (besides confusing generic characters with specific ones).

wings.¹ Falx very big, long and thick, fatter than in *Chilades*, and not distinctly separated to the eye into its components (humerulus, elbow, etc.) owing (1) to its not bunching at the shoulder as it does in *Chilades* (in ventral view); (2) to the unusual (unique in *Plebejinæ*, typical in *Catochrysopinæ*) slant in the part that corresponds to the, very upright, forearm of *Chilades*, with a consequently wide and weak falcal arch; and (3) to its even breadth from basal point to almost three-quarters of its length; thus of a limacine appearance increased by the fact (again unique in this subfamily, but frequent in *Catochrysopinæ*) that in ventral view the point of the oblique falx seems twisted away from the lobe instead of curving hookwise toward the latter as it does in *Chilades* (or other genera) where it attains the tip of the lobe. Uncus lobe narrow and long, exceeding the length of the tegumen (from base of falx to beginning of cingula) which is not the case in *Chilades* nor indeed in any other genus of the subfamily; tapering above the humerulus to form a finger-shaped projection of even breadth throughout; slightly excurved (in contrast to the straight "gothic" projection in *Chilades*) and at least $1\frac{1}{2}$ narrower than the forearm. Valve exceedingly small and squat, about half the ædeagus and about equal to the falx in length, the first proportion only approached in one other species of *Plebejinæ* (*Hemiargus ramon* Dognin) and the second unique in the subfamily (but common in other Lycænids); of a peculiar stunted appearance, shaped like an elephant, about one and two-fifths as long as broad, thus strikingly different from the elongated shape of *Chilades* and all Old World members of the subfamily; with a strongly and evenly curved processus superior ending in a thickish gradually tapering rostellum (about a third of the valve in length), which continues the even curve of the whole upper margin and comes to rest upon the well-developed, strongly jutting mentum, the tip of which may assume a fluted appearance *in situ*.

Female: fibula of ostium bursæ strongly developed, of the *Chilades* type, with the upper lamella conspicuously long (about 0.3 mm.). Papillæ anales about 0.45 mm. broad and very large in relation to the short looking rods (about 0.6).

Measurements (in mm.): ædeagus 0.9–1, suprazonal portion

¹ The *titicaca* lobe length is only attained in *Chilades* by one species (*cleotas*, pl. 2, CLE 3) in which the whole alar surface is 5.4 times greater and the fore-wing 2.5 times longer than in *titicaca*, while in *galba* forms (e.g. pl. 2, CON 3)

0.44–0.52 (mean 0.49), subzonal 0.44–0.54 (mean 0.49); breadth (in lateral view) at zone 0.16, proximad 0.12; penis mean 0.85. Furca 0.37. Falx 0.5 by 0.07 to 0.55 by 0.1 (mean 0.52 by 0.08); uncus lobe 0.5 by 0.045 to 0.55 by 0.055 (mean 0.52 by 0.05). Valve 0.54 by 0.39 to 0.55 by 0.4 (mean 0.54 by 0.4).

It is possible that individuals or broods or racially constant forms of *titicaca* with a complete underside forewing set of (seven) II macules and (seven) split I macules exist somewhere in the Andes. The general tendency, however, is to complete obsolescence (Staudinger selected for his figure of "*Lycæna speciosa*" an individual with still visible I RM and M_1 II and M_2 II; Weymer's only fresh specimen had none). The narrow and pointed (almost tineoid) wing-shape is found elsewhere among *Plebejinæ* of great altitudes (e.g. in a Himalayan form of *Albulina orbitulus* Prun.). In the hindwing (see fig. 1), the termen strongly recedes (below vein M_2) from scale line 85 to 50 (at vein 2A). The I macules are obsolescent, except the CU_1 præterminal mark which is distinctly pigmented in some specimens. The II macule is weakly pigmented (except marginally, especially along the outer edge in most specimens) from Sc to cell M_2 (between, roughly, scale lines 30–40, 35–50, 50–60, 50–60), fairly strongly (with very strong edges) from M_3 to cell Cu 2 (35–60, 30–40, 30–35,) and is very weak in 1A and 2A. The III macule is weakly pigmented (except the proximal edge) in Sc (0–20) and fairly strongly (with still stronger edges) in Cu_2 (10–20). The I discoidal RM (30–35) is very weak while the II one (R 12–25 + M 5–25) is fairly strong (with still stronger edges). All the macules except the anal ones and the Cu_1 præterminal mark (60–65) fill the transverse breadth of the interspace (forming, if viewed from the termen a capital omega in the case of the II series, and a somewhat similar design in the case of Sc III, II RM, Cu_2 III) and are squarish, or of a roughly triangular shape if extending to 15 or more scale lines (along the upper vein of the cell as Sc III and Cu_1 II do, or along the lower one as II M and R, II do). I give these scanty notes and a figure, since no intelligible description of the species exists.¹

where dwarfs from Cyprus approach my largest *titicaca* (length of fore wing 8.5 mm.) in wing span (though of course the wings remain always much fuller than in *Parachilades*), the lobe is at least twice smaller than in the latter.

¹ For a full discussion of the terminology employed see my paper (1944 *op. cit.*) on the pattern of *Lycenidæ* as expressed in *Lycæides*.

Pseudothecla n.g.(figs. *FIG*, pl. 2)

Type and only known species: *Thecla faga* Dognin 1895, Ann. Soc. ent. Belgique 39: 105-106 "Loja, Ecuador" (= ? *excisicosta* Dyar 1913, Proc. United States Natnl. Mus. 45: 637-638 "Cotahuasi; Chuquibamba, Peru").¹

One male investigated: prep. 611, "Peru," *ex* coll. Huntington, Am. Mus. Nat. Hist. (with a somewhat more weakly marked underside than Dognin's description suggests).

Ædeagus two-thirds of a millimeter in length, very slightly incurved distally, rather thickset, not unlike certain *Plebejus* species in type, the suprazonal portion hardly more than half the subzonal one in length, the vesical opening at 0.8 mm. from the zone, the vesica plain, rather weakly defined, thickly shielded ventrally by the suprazonal sheath; alulæ and tabs small. Furca resembling *Parachilades*, the branches still thicker, conspicuously curved, equal in length to the subzonal portion of the ædeagus. Traces of a thin membrane (? rudiments of sagum) between the latter and the furca. Falx bearing a general resemblance to certain *Plebejus* and *Vacciniina* species, its outline, however, more evenly rounded throughout. Forearm slim, incurved, tapering to a sharp point, subequal to the suprazonal portion of the ædeagus, humerulus thickish with a weak shoulder. Uncus lobe small, shorter than the forearm, rather narrow and blunt. Valve of the normal (fishlike) subfamilial shape, but exceedingly small, subequal in length to the ædeagus, about twice as long as broad, nicely tapering basad. Processus superior strongly scooped out at the rostellum which thus seems to be produced from a point lower than the upper margin of the valve and is curiously shaped: anteriorly forming a sharp point, posteriorly producing a kind of small heel at about half of the length of its inner margin.

Measurements (in mm.): ædeagus 0.67, suprazonal portion 0.24, subzonal 0.43 with breadth (lateral view) 0.11; penis 0.64. Furca 0.44. Vertical/Horizontal extension of uncus: forearm 0.27/0.033, humerulus 0.07/0.14, shoulder 0.11/0.05, lobe 0.2/0.06. Valve 0.65 (to tip of rostellum 0.76) with breadth 0.31.

This is a very curious addition to the subfamily.

¹ *Sylphis* Draudt 1921 (*in* Seitz, *Macrolep. World* 5: 823, "Cuzco (Peru)," pl.

Pseudochrysops n.g.

(figs. BOR, pl. 2,7)

Type, and only known species: *Hemiargus bornoi* Comstock-Huntington 1943 (Ann. New York Acad. Sci. 45 : 102-104, "Pont Beudet, Haiti," pl. 1, figs. 18 ♀, 19 underside; Comstock, 1944, Rhopalocera, in Miner, Scient. Survey Porto Rico and Virgin Isls. 12 : 498-499, fig. 16 venation).

Two male paratypes and one female paratype (all *ex coll.* Am. Mus. Nat. Hist., Mus. Comp. Zool.) investigated: prep. 496, 604, ♀ 605, all "Pont Beudet, Haiti, about 100 ft., 3-4-III-1922."

Ædeagus slim, elongated, 1 mm. long, suprazonal portion equal to subzonal one; ventral part of subzonal sheath slightly notched distally, acuminate in lateral view; vesical opening high, about half-way up from the zone, alulæ small, Chapman's process slight, vesica weak, unarmed, the whole organ vaguely intermediate between *Chilades* and *Freyeria*.¹ Sagum rudimentary, in the form of two weak ill-defined lobes produced from the zone ventrad. Furca well developed, in length subequal to the subzonal portion of the ædeagus, of a conventional subfamilial shape, but with a broad membraneous lining giving it a lobed appearance *in situ*. Falx and uncus lobe different in type from *Chilades* although related to it in general elongation, much more strongly developed than in *Freyeria*, but otherwise definitely allied to the latter. Forearm more than a third of a mm. long, slightly overtopping the uncus lobe, remarkably slender and straight, very gradually tapering to a minutely hooked point, elegantly elbowed, more finely drawn and direct than in *Freyeria*, similar in these features to *Lycæides melissa* Edwards, but combined with a differently shaped, comparatively high shoulder, as in *Freyeria*, only finer in outline. Humerulus more than twice shorter (horizontal extension) than forearm (vertical extension), remaining evenly slender, and hardly thicker (vertical extension) than forearm (horizontal extension), for slightly over half of its length from elbow point, then abruptly expanding to almost double of its vertical extension to form a delicate, small but conspicuous shoulder, its out-

144, n) ought to be also checked in relation to *faga* (*op. cit.* : 823-824, pl. 144, m). Both are doubtfully placed by Draudt in *Scolitantides auct.*

¹ *Freyeria* is less close to *Chilades* than to *Lycæides*, its nearest ally.

line convex posteriorly and somewhat concave below its prominent anterior point. Uncus lobe very long, thicker and blunter than in *Chilades*, somewhat related to *Plebejus*, slightly ex-curved, just above one-half the length of the tegumen proper, twice broader than the forearm and more than five times as long as broad. Valve bearing a false resemblance in shape to *Iolana* Tutt (*Glaucopsychinæ*); in general proportions likewise resembling *Parachilades*; in character of rostellum somewhat allied to *Pseudothecla*; in basic structure truly allied to the next genus; very short, at its broadest (very distal) part about three-quarters as broad as long, shorter than the ædeagus, about sixteen times shorter than the length of the forewing (which is about 11 mm.) [the latter ratio being one-eighth in *Freyeria* (about 7 mm.) where, as in all Old World *Plebejinæ*, the valve is longer than the ædeagus], subtriangular, strongly expanding from its bluntly rounded base to form a buffalo hump; the process superior abruptly sloping from that point to evenly rise again at a point immediately below whence it projects distad as a slender, very slightly incurved, horn-like rostellum, in length just under one-sixth of the whole process. Stretch between rostellum and mentum extensive and steep, lending the valve a gaping appearance, this effect being due not to any special feature of mentum or distal margin of valval membrane, but to the rudimentary or aborted (despite the horn-like free end) condition of the upper process which in all other *Plebejinæ* is long enough to allow the rostellum to rest on the mentum.¹

Female: fibula well developed, about 0.16 long by as much broad, consisting of a triangular portion over an oppositely directed cordate one. Papillæ anales small, about 0.3 broad by 0.2 long with comparatively very long (0.82) rods.

Measurements (in mm.): ædeagus 1, suprazonal portion 0.5, subzonal 0.5 with breadth (in lateral view) 0.11; penis 0.93. Furca 0.47. Sagum 0.33. Vertical/Horizontal extension of un-

¹ *In situ* the end of the processus superior of *bornoi* tends to be infolded, i.e., to overlay the ventral concavity of the valve as occurs also in *Parachilades*, *Chilades*, and *Hemiargus* (s.s.). Another character of these valves (and also that of the next genus) which lack the regular bullula of other genera is the fact that under pressure the whole margin below the rostellum has a trick of bulging (producing as it were a second mentum), a circumstance which incidentally misled Bethune Baker (1913, Trans. Ent. Soc. London 1913: 201-204) in his rather confused attempt to separate what he called *phiala* Grun Grshimailo (of which he examined, at the best, a locotype or cotype — not the actual type as wrongly stated : 204) from the absolutely conspecific *galba* Lederer.

cus : forearm 0.35/0.03–0.36/0.025, humerulus 0.04/0.17, shoulder 0.1/0.07, lobe 0.36/0.065. Valve 0.63–0.66 with breadth 0.5. Rostellum 0.18.

In pattern characters this rare and remarkable butterfly belongs, together with a few other genera or aberrant species, to what may be termed the "catochrysopoid" pattern group in *Plebejinæ* (some notes on the subject will be found further on and at the end of this paper), none of the members of this group having, however, any structural connection whatever with the *Catochrysopinæ* genitally. Moreover, the present assignment of *bornoi* and *faga* to the true *Plebejinæ* adds two "tailed" species to the small number (all in *Chilades*) already known (first recognized by Chapman 1916).

Cyclargus n.g.

(figs. DOM, AMN, WOO, TH, pl. 3; AMN, pl. 7)

Type: *Lycæna ammon* Lucas 1857

Four species known¹:

ammon Lucas (*Lycæna*, 1857, Lép., in la Sagra, Hist. . . . Cuba 7 : 612, "Cuba," pl. 16, figs. 7 ♂, a ♀, b; *Lycæna filenus* Holland [*nec* Poey] 1931, Butt. book, pl. 68, figs. 2 ♀ [*nec* ♂], 3 ♀, 4 ♂; *Hemiargus ammon ammon*, Comstock-Huntington, 1943, Ann. New York Acad. Sci. 45 : 95–96; "Havana, Cuba, winter brood").

dominica Möschler (*Lycæna*, 1886, Abhandl. Senckenberg, naturforsch. Ges. 14 : 26, "Jamaica," fig. 10 [*fide* Comstock-Huntington, 1943, *op. cit.* : 101–102]; *Hemiargus ammon f. dominica*, Draudt, 1921, in Seitz 5: 820; *Hemiargus dominica*, Comstock-Huntington, 1943, *l.c.*).

thomasi Clench (*Hemiargus catilina auct. ssp.*, 1941, Mem. Soc. Cubana hist. nat. 15 : 407–408, "Arthur Town, Cat. Isl., Bahamas"; *Hemiargus bahamensis* Clench, 1943, Psyche 49 : 57, "Crooked Isl., Bahamas") comprising *thomasi thomasi* Clench (*Hemiargus ammon thomasi*, Comstock-Huntington, 1943, *op. cit.* : 97 "Bahamas"), *thomasi bethune bakeri* Comstock-Huntington (*Hemiargus ammon ssp.*, 1943 *op. cit.* : 97–99, "Miami, S. Florida, winter brood," pl. 1, fig. 25 ♂; *Hemiargus catilina* Bethune Baker [*nec* Fabricius] 1916, Ent. News

¹ Listed in chronological order. The obvious systematic sequence is: *dominica*, *ammon*, *woodruffi*, *thomasi*.

27 : 454; Holland, 1931, *op. cit.*, pl. 30, fig. 45 ♀, pl. 31, fig. 31 ♀) and *thomasi noeli* Comstock-Huntington (*Hemiargus ammon* ssp., 1943, *op. cit.* : 99–100, "St. Marc, Haiti" pl. 1, fig. 23 ♂).

woodruffi Comstock-Huntington (*Hemiargus ammon* ssp., 1943, *op. cit.* : 100–101, "Anegada, Virgin Isls.", pl. 1, fig. 24 ♂).

GENERIC DESCRIPTION

Ædeagus in a very general way allied to *Pseudochrysops*, smaller, stubbier, from just under 0.65 to just over 0.8 long; suprazonal portion about half or just over one-half the subzonal one; ventral side of suprazonal sheath notched distally; vesical opening beginning at about half-way or two-thirds from the zone on dorsal side, at first very narrow, with distinct lateral portions then brusquely allowing the vesica to expand; the latter very plump (facing more or less distad), in lateral view not unlike a pin cushion, in dorsal view resembling a bourbon crown; set with about 120–160 comparatively large (0.003) cornuti in several regular rows of about ten and more or less distinctly divided by the thin point of Chapman's process; alulæ and subzonal portion of the usual type in the subfamily, the former about 0.1 long, the latter compressed laterally, broader in lateral than in ventral or dorsal view. Furca small, slightly shorter than the subzonal portion, more efficiently holding it in the forking than in Old World types. Sagum well developed, consisting of two convex (ventrad) lobes about 0.4 long by 0.2 broad, connected at the zone with the alulæ, and below the zone with the points of the furca, converging in front (*i.e.*, on the ventral side) of the ædeagus in the manner of a stiffly bulging short waistcoat, too ample as it were for the body it encloses, and edged at and along its margins (which appear distally projected in lateral view and thus differ from other sagum bearing genera to be discussed) with conspicuous teeth reaching 0.03 in length. Uncus, especially falces, extremely small and weak. Falx allied in type only to one Old World genus, namely *Aricia*; in shape resembling a beheaded dromedary, the part of the "neck" being taken by the straight, rather bluntly tapering, plain-tipped vertical projection (forearm) of the falx, and the "hump" being represented by the high evenly shaped vertical shoulder of the medially thickish, straight, rather long hori-

zontal extension (humerulus) of the falx (see pl. 1, fig. 4). Uncus lobe subtriangular *in situ*, spoon shaped when slightly compressed in flat ventral view, from slightly to one-fifth longer than the falx and hardly two-thirds the length of the lobe of *Pseudochrysops bornei*. Valve allied to that of the latter but better developed in the processus superior, thus approaching a more normal (though still very squat) *Plebejinæ* shape which it resembles only insofar as a puffer resembles a pike; very small and short, hardly attaining the length of the ædeagus, twice or less than twice as long as broad, heavily humped; the hollowed outline formed by the mentum (which here seems somewhat upturned *in situ*) and the (strongly receding here) margin of the body of the valve extending laterally (*i.e.*, subparallel to the long axis of the valve) rather than "vertically" as it does in *bornei* (where the upper process is poorly developed); the free part of the upper process (rostellum) throughout its length snugly resting upon and merging with the hollowed margin, but when manipulated seen to be sinuous, flexible looking and long; ending in a more or less broad coxcomb with well developed or greatly developed teeth oriented along the long axis of the valve, longer relatively to it than in other *Plebejinæ* (except one pale-arctic species, *Plebejus argus* L. where, however, they point obliquely down as in *Itylos*, *sensu mihi*), and providing the main characters for distinguishing the four species.

Female: fibula resembling *P. bornei* but shorter (0.1 long by as much broad distally and twice broader proximally). Everted henia stumpy and short.¹ Papillæ anales about 0.3 long by 0.3-0.4 broad, with rods 0.7 long, thus shorter (both in relative and absolute size) than in *bornei*.

Cyclargus dominica Möschler

(figs. DOM, pl. 3)

Two males investigated: prep. 501, "Baron Hill, Jackson Town, 1200 ft., March, *leg.* L. Perkins," Mus. Comp. Zool., and 508, *id.*, "July," *id.*

Ædeagus 0.75 long, suprazonal portion shorter by half than

¹ My impression is that the extensibility of the henia and its prop so marked in all *Plebejinæ* (see Chapman, 1916 *op. cit.*) is more limited in *Pseudochrysops*, *Cyclargus* and *Hemiargus* (*s. mihi*) in contrast to the rest of the neotropical genera examined which conform to the Old World type in this respect. I have dissected, however, only a few females and my results should be checked on more material.

the subzonal one with a weakly excurved, somewhat slipper-shaped suprazonal sheath, which opens dorsally at about one-third from the zone. Forearm subequal to uncus lobe. Valve twice as long as broad. Comb narrow, with receding edge; 12 to 16 teeth: first and second equal, slightly broader than, but otherwise as long as, the rest which are sharp and subequal *inter se* except for a perceptible reduction in the last three or four.

Measurements (in mm.): ædeagus 0.75, suprazonal sheath 0.25, subzonal 0.5 with breadth (in lateral view) 0.14; penis 0.65. furca 0.45. sagum 0.45. Vertical/Horizontal extension of uncus (prep. 501): forearm 0.22/0.05, humerulus 0.07/0.19, shoulder 0.13/0.07, lobe 0.23/0.06. Valve 0.55–0.7 with breadth 0.33–0.35; comb: breadth 0.12; first and second tooth: length (bisetrix from apex to line prolonging basad the outer edge of third tooth) 0.016 and 0.016

Cyclargus ammon Lucas

(figs. AMN, pl. 3)

Three males and two females investigated: prep. 507, "Sierra Maestra, East Cuba, 1000 ft., 16–VI–1930, *leg.* Clorinda Querci," *ex coll.* Weeks, Mus. Comp. Zool.; 375, *id.* "23–VII–1930" *id.*; N, *id.*; ♀ 530, *id.*, "3–XI–1929, *leg.* O. Querci," *id.*; ♀ 529, "Cuba, *leg.* Ch. Wright," Mus. Comp. Zool.

Differing from *dominica* in the following: Valve somewhat broader; comb broader, with circular edge; first and second tooth (equal) one-third longer than in *dominica* and the rest somewhat broader than in that species.

Measurements (in mm.): ædeagus 0.63–0.75; suprazonal portion 0.23–0.25, subzonal 0.4–0.5 with breadth (in lateral view) 0.14; penis mean 0.65. Furca 0.45. Sagum 0.45. Vertical/Horizontal extension of uncus: forearm 0.16/0.025–0.22/0.04, humerulus 0.05/0.12–0.08/0.16, shoulder 0.1/0.05–0.18/0.06, lobe 0.21/0.05–0.24/0.06. Valve 0.6–0.65 with breadth 0.4–0.42; comb: breadth 0.15; first and second tooth: length (measured as in *dominica*) 0.028 and 0.028.

Cyclargus woodruffi Comstock-Huntington

(figs. woo, pl. 3)

One male investigated: prep. 537, "Tortola, Virgin Is., 2–IV–1925" *ex coll.* Amer. Mus. Nat. Hist., Mus. Comp. Zool.

Differing from the two preceding species in the following: ædeagus (similarly proportioned and shaped) distinctly larger; uncus lobe slightly longer; comb in actual breadth intermediate between *dominica* and *ammon* but appearing as broad as in *ammon* owing to the greater development of first and second teeth, the latter being intermediate in size between *dominica* and *ammon*, and the former about twice longer than in *dominica* and about one and one-half times longer than in *ammon*; the rest of the comb more finely serrated, with a greater number of teeth (21) than in the two preceding or in the next species.

Measurements (in mm.): ædeagus 0.83, suprazonal portion 0.28, subzonal 0.55 with breadth (in lateral view) 0.15; penis 0.7. Furca 0.42. Sagum 0.43. Vertical/Horizontal extension: forearm 0.2/0.04, humerulus 0.05/0.16, shoulder 0.13/0.06, uncus lobe 0.27/0.06. Valve 0.71 with breadth 0.42; comb 0.15; first and second teeth: length (measured as in *dominica* and *ammon*) 0.039 and 0.02.

Cyclargus thomasi Clench

(figs. TH, pl. 3)

Nine males and one female investigated (all in Mus. Comp. Zool.): *thomasi thomasi* Clench, holotype, prep. 520, "Arthur Town, Cat Isl., Bahamas, 16-VII-1935, leg. W. J. Clench"; paratype, prep. 492, *id.*; 516, 565, "Great Inagua, Bahamas, II-1934, leg. Armour Exp.; [holotype of "*Hemiargus bahamensis* Clench"] 490¹ "Crooked Isl., Bahamas, 1-III-1934, *id.*"; *thomasi noeli* Comstock-Huntington, paratype, prep. 502, "Haiti, leg. P. R. Uhler"; paratype, prep. 521, "San Domingo, Hispaniola" *ex coll.* Weeks; ♀ 531 "Beata Isl., *id.*, 17-I-1932" leg. Armour Exp.; *thomasi bethune-bakeri*, prep. 519, "Ft. Lauderdale, Florida, 23-VI-1933, leg. M. Bates"; 581, "Miami, *id.*, 8-15-IX," *ex coll.* Weeks.

Differing from the three other species in the following: ventral outline of suprazonal sheath in lateral view curiously concave above the zone and then angled, this being due to a higher (at two-thirds from the zone) and still more distally facing

¹ This is an aberrative male of *ssp thomasi* showing a pretty contrast between the blurred and darkened disc of the underside of both wings and the strongly developed white cretules, while a very luminous scintilla rims and almost engulfs the Cu₁ præterminal mark. I doubt very much that this can be a subspecifically constant combination of characters on Crooked Isl.

vesical aperture; uncus a shade slighter than in *ammon*; comb greatly developed: first tooth hypertrophied, four times longer than in *dominica*, two and a half times longer than in *ammon* and twice longer than in *woodruffi*; second tooth about a third of the first (the rest as in *ammon* with same number of teeth as in that species and *dominica*).

Measurements (in mm.): ædeagus 0.68–0.72, suprazonal sheath 0.22–0.27, subzonal 0.45–0.46, with breadth (in lateral view) 0.11; penis mean 0.63. Furca mean 0.38. Sagum mean 0.43. Vertical/Horizontal extension of uncus: forearm 0.14/0.03–0.17/0.035, humerulus 0.045/0.12–0.06/0.14, shoulder 0.1/0.05–0.14/0.06, lobe 0.2/0.05–0.21/0.06. Valve 0.64–0.75 with breadth 0.35–0.4; comb; breadth 0.2; first and second tooth: length (measured as in the three other species) 0.07 (0.06–0.08) and 0.022 (0.02–0.028).

No subspecific structural distinctions are noticeable and anyway the wing-characters on which the subspecific names have been based must be revised as the comparisons were drawn between non-conspecific forms.

The catochrysopoid wing-characters of the *Hemiargus-Echinargus-Chilades-Cyclargus-Pseudochrysops* macroscopical group¹ in *Plebejinæ* are perhaps most beautifully expressed in the hind-wing underside of *Cyclargus*. These combinational characters are in this genus: the conspicuously strong pigmentation of macules ScII, ScIII, Cu₂III,² 2AII, IIM and lateral macule in 4A (placed in corbic arrangement if viewed from base and strikingly resembling the African *Euchrysops* group) and of the Cu₁, Cu₂ and 1A præterminal marks (with scintillæ), in contrast to the extreme weakness of all other whole and split macules; (2) the ornamental concentration of an aurora in Cu₁ in contrast to the whiteness of all the other I intervals; (3) the subtriangular shape of these intervals and of the faint portions of I macules (both wings); (4) the rough quadrate shape of certain macules in the disc (both wings); (5) the strong development of halos, cretules and white scales intermixed with the ground

¹ The only other *Plebejinæ* having certain catochrysopoid wing-characters (of another type) are: the central Asiatic *Agrodiatus elvira* Eversmann (which departs in an extraordinary way from the pattern of its numerous congeners) and the nearctic alpine *Icaricia shasta* Edwards (two characters).

² Absent in *ammon ammon* as correctly noted by Comstock and Huntington 1943 *op. cit.* : 96 where, however, there is a clerical error in the notation of the position of the macule in question.

pigment; (6) the halo of I M partly (posteriorly) fusing with that of M₂II.

Hemiargus Hübner [revised]

(figs. CE, RAM, IIA, pl. 4; HAN, CER, pl. 7)

1818, Zuträge Exot. Schmett. 1: 10

Since *Papilio hanno* Stoll 1790, here found to be a different species from *Hesperia ceraunus* Fabricius 1793, is not mentioned in the Zuträge, Scudder's selection (1875, Proc. Amer. Acad. Arts Sci., Boston 10: 186) and Hemming's confirmation (1934, Gen. names Holarctic Butt. 1: 104) of the type as *hanno* Stoll cannot stand.

Type: *Hemiargus antibubastus* Hübner 1818 (*Hesperia ceraunus* Fabricius 1793, subspecies).

Three known species:

ceraunus Fabricius, including *ceraunus ceraunus* Fabricius (*Hesperia ceraunus*, 1793, Ent. Syst. 3: 333, "[W. Indies]"; *Lampides ceraunus*, Butler, 1869, Cat. diurn. Lep. Fabricius: 163, "Jamaica"; *Hemiargus hanno ceraunus*, Comstock-Huntington, 1943, Ann. New York Acad. Sci. 45: 107-108), *ceraunus antibubastus* Hübner (*Hemiargus antibubastus*, 1818, l.c., "Georgia"; *Lycæna hanno* Holland [nec Stoll] 1931, Butt. Book, pl. 32, fig. 3 ♂; *Hemiargus hanno antibubastus*, auct.), *ceraunus filenus* Poey (*Polyommatus filenus*, 1832, Centurie Léop. Cuba: [41-42], "Cuba," pl. [13], figs. ♀ ♂; *Hemiargus hanno filenus*, auct.), *ceraunus gyas* Edwards (*Lycæna gyas*, 1871, Trans. American Ent. Soc. 3: 210-211, "Arizona"; Holland 1931 *op. cit.* pl. 47, figs. 3 ♂, 4 ♂ "typical"¹; *Hemiargus gyas*, McDunnough, 1916, in Barnes-McDunnough, Contrib. Lep. N. America 3: 108-109; *Lycæna astragala* Wright, 1906, Butt. W. Coast: 232-233, "San Bernardino, California," fig. 401 ♂; *Lycæna florenciæ* Clémence, 1914, Ent. News 25: 28-29, Huachuca Mts., S. Arizona") and *ceraunus zachæina* Butler-Druce (*Lampides zachæina*, 1872, Cistula ent. 1: 104-105, "Cartago, Costa Rica"; Butler, 1873, Lep. Exot.: 157, pl. 57, fig. 1 [poor]);

hanno Stoll, including *hanno hanno* Stoll (*Papilio hanno*,

¹ The locality label of the ♂ figured by Holland should be checked, as one is never safe with that author. McDunnough (1916 l.c.) was the first to point out that *gyas* could not be separated genitally from *antibubastus*, and W. Comstock (1943:109) noted that the latter was structurally identical with *filenus*.

1790, in Cramer, suppl. : 170, "Surinam," pl. 39, figs. 2, 2B; *Hemiargus hanno hanno*, Comstock-Huntington, 1943, *op. cit.* : 104-106, "Paramaribo, Surinam"), *hanno bogotana* Draudt (1921, in Seitz, Macrolep. World 5: 819, "Bogota, Colombia," pl. 144,k) and *hanno watsoni* Comstock-Huntington (1943, *op. cit.* : 106-107, "San Juan, Puerto Rico"; pl. 1, fig. 20 ♂ "Guayanilla, Puerto Rico");

ramon Dognin (*Lycæna*, 1887, *Naturaliste* 9: 189-190, "Loja, Ecuador," fig. 4 ♂).

GENERIC DESCRIPTION

Ædeagus very long in relation to the other parts of the armature, with a neck-like suprazonal portion (as if the corresponding part in *Cyclargus* had been telescoped out). Suprazonal sheath in ventral (1), dorsal (2) and lateral (3) view: (1) slightly expanding at its termination where it is slightly notched, each of the resulting portions being armed with five or six ventro-laterally placed spinules; (2) revealing at more than half-way from the zone a narrow vesical fissure, the rather rough margins of which, just before expanding slightly to form the vesical opening proper (which is as long as the fissure), are somewhat drawn together and produce at this point two surculi, one on each side; (3) rather strongly incurved, with the vesical opening facing more or less distad and appearing still shorter than it is owing to the vesical slit not being seen from this angle, so that the eye mistakes the projection in profile of the paired surculi (directed dorsad and proximad) for the protruding nether "lip" of the opening.¹ Vesica, as seen laterally, pulvinate as in *Cyclargus*, but with smaller cornuti. Alulæ hardly, if at all, differentiated from the sagum, which is rudimentary, with no trace of teeth. Furca small, well adjusted to the ædeagus subzonally as in *Cyclargus*. Falx resembling *Cyclargus* but somewhat stronger and thicker. Uncus lobe evenly tapering to a blunt point. Valve small, shorter than the ædeagus, approaching the *Plebejinæ* shape-norm somewhat better than *Cyclargus* which it resembles only in the shoe-shaped mentum with no trace of a bullula and in the freedom of the rostellum; the latter, however, lacking any serration, with a bluntly tapering

¹ Moreover, from a certain angle, and especially in *hanno*, these surculi are easily mistaken by the eye for modified alulæ that would have been carried away from the zone by the generic distal extension of the ædeagus.

tip, and somewhat resembling in curvature (especially in the genotype) the kind of rostellum obtained among Old World genera only in *Chilades galba* Lederer (*sensu mihi*, i.e. including Eastern Mediterranean, Caspian, Arabian and Indian forms considered by authors as being distinct species, i.e. *galba* Lederer, *phiala* Grun Grshmailo, *ella* Butler and *contracta* Butler) and by an aberrant *Albulina* (*auct.*) species, *felicis* Oberthur, of the southern part of the Central Palearctic region, in which species, however, the tip is toothed.

Female: henia shortish and curiously thick (with apparently reduced extensibility as in *Cyclargus* and thus unlike *Chilades*), strongly chitinated dorsally. Fibula resembling *Chilades*, pistol-shaped in profile (pointing distad), in ventral view seen to consist of a lamellate ventral piece and a horseshoe-shaped dorsal one.

Hemiargus ceraunus Fabricius

(figs. CE, pl. 4; CER, pl. 7)

Twenty-eight males and one female (all in the Mus. Comp. Zool. coll.) investigated: *ceraunus ceraunus* Fabricius, prep. 570 and 571, "Kingston, Jamaica, 6-XII-1871" *ex coll.* Scudder; *ceraunus ceraunus prox.*, prep. 499, "Ennery, Haiti, near 1,000 ft. alt., 16-VIII-1934, *leg.* M. Bates"; prep. 567, "Port au Prince, Haiti, up to 2,000 ft. alt., 2-IX-1934, *leg.* M. Bates"; and prep. 566 "Navassa Is., W. Indies, XII-1929, *leg.* W. J. Clench"; *ceraunus antibubastus* Hübner, prep. 525, "Egmont, Florida, 23-IV-1904," *ex coll.* Fall; prep. 580, "Florida," *ex coll.* Weeks, and prep. 582 ♀, "Ft. Lauderdale, Florida, 10-VII-1933, *leg.* M. Bates," prep. 339, "Valdosta, Georgia, 9-X-1943, *leg.* V. Nabokov"; and prep. 579, "So. Abington, Massachusetts, V-1880, *leg.* J. E. Bates" *ex coll.* Weeks; *ceraunus filemus* Poey, prep. 374, 497, 506, 515, and 561, "Sierra Maestra, E. Cuba, 1,000 ft. alt. . . . *leg.* O. Querci," *ex coll.* Weeks, taken "31-XI-1929," "29-V-1930," "22-VII-1930," "10-XI-1929" and "25-V-1930" respectively (individual 515 with unusually strong macules of series II underside); prep. 562, "Vinales, P. del Rio, Cuba, *leg.* L. de Jaume"; and prep. 563, "Central Soledad, Cuba, 27-VIII-1932, *leg.* B. B. Leavitt"; *ceraunus gyas* Edwards, prep. 523, "Baboquavaria Mts., Pima Co., Arizona, 15-30-VII-1903, *leg.* O. C. Poling," and prep. 574, "Cochise Co., Arizona," *ex coll.* Weeks; *ceraunus gyas prox.*,

prep. 400 and 524, "San Diego, California, 14-VIII-1908, *leg.* Geo. H. Field," *ex coll.* Fall; *ceraunus zachaina* Butler, prep. 513, "Punto Araras, Costa Rica, 11-XI-1871," *ex coll.* Scudder; prep. 510, "Acahuato, Michoacan, Mexico, 3,000 ft. alt., on *Cordia*, 19-VIII-1941, *leg.* R. Haag," and prep. 509, 572, and 613, "Apatzingan, Michoacan, Mexico, 1,200 ft. alt., moist jungle La Majada, at mud, 8-VIII-1941, *leg.* R. Haag"; other *ceraunus* forms: prep. 564, "Clarencetown, Long Is., Bahamas, II-1934, *leg.* Armour Exp."; prep. 504 "Vancouver Is." *ex coll.* Paine; prep. 575, "Colombia," *ex coll.* Paine.

Suprazonal portion of ædeagus in lateral view somewhat bottle-necked before the slight vesical expansion; longer than the subzonal portion; with five conspicuous spinules on each side: the first (counting proximad), at about 0.05 from tip (thus on the level of the apex of the ventral notch), 0.008 long, the next, immediately beneath, 0.018 (maximum), the third and fourth both 0.022 (max.), likewise placed together, at about 0.015 proximad from second and about the same distad from the fifth which is subequal to the latter. Vesical opening plus fissure somewhat less than half the suprazonal sheath. Surculi forming in profile a small sharp projection about 0.025 long. Furca about a fourth of the ædeagus, connected with the uneven but not actually serrated flaps of the indistinctly two-lobed sagum which rather loosely hangs from the zone ventrad. Falx with a thick blunt forearm and a high shoulder about half the forearm in height. Valve slightly shorter than the ædeagus, about twice as long as broad, resembling a *Chilades* valve in miniature but with a somewhat sharper mentum. Rostellum more or less distinctly angled about half-way down, with a plain, in some specimens slightly upturned tip (as in *Chilades galba*) descending in front of the mentum.

Female: ventral piece of fibula 0.13 long by 0.2 broad. Pa-pillæ anales 0.35 by 0.3. Rods 0.75.

Measurements (in mm.): ædeagus 0.8-1.0, suprazonal portion 0.51-0.56 (mean 0.54), subzonal portion 0.30-0.44 (mean 0.40) with mean breadth 0.09 (in lateral view); penis mean 0.80; furca mean 0.24; sagum mean 0.3. Vertical/Horizontal extension of uncus: forearm 0.23/0.045-0.3/0.06 (mean 0.27/0.05), humerulus mean 0.075/0.15, shoulder mean 0.15/0.09, lobe 0.27/0.05=0.33/0.07 (mean 0.30/0.06). Valve: 0.65-0.80 (mean 0.74) with breadth 0.25-0.47 (mean 0.33).

The length of the suprazonal portion is very steady at just above 0.5; the subzonal one is more variable; it reaches 0.44 in most individuals from Jamaica and Mexico, as well as in one Californian specimen and in the only Colombian one. The falx and uncus lobe reach their maximum in one specimen from Cuba (Vinales) as well as in those from Florida and in the very large (length of forewing 13.2 mm.) specimen from Vancouver Island.¹ The valve is rather variable in size, as well as in the length/breadth ratio. The narrowest come from Jamaica, Cuba, and the S. E. States, the broadest from Haiti and Mexico (together with average individuals). The curious bloated appearance of some of the shorter Central American specimens (see pl. 4, CE. Mex., CE.C.R.) is due to the lower margin being strongly convex and there is also a certain fattening of the rostellum.

In result of the separation of *ceraunus* from *hanno* (see next species) a revision of the wing-characters of several races will be necessary, either because they have been described as separate species or because authors assigned them to the wrong species and thus did not compare them to the typical race of the right one. Incidentally, attention should be drawn to the fact that the retention of strong pigment not only in the Cu_1 præ-terminal mark but also in the M_3 one is a phenomenon that occurs, completely and incompletely, racially and individually, both in *ceraunus* and *hanno* (besides being typical in *ramon*), and no subspecies can be based on this character *alone*, since it can be developed in two different races of the same or different species.

Hemiargus hanno Stoll

(figs. IIA, pl. 4; HAN, pl. 7)

Material: sixteen males and one female (all in the Mus. Comp. Zool. coll., except prep. 601), as follows: *hanno hanno* Stoll, neotype, prep. 601, "Paramaribo, Surinam, 18-IV-1927," ex coll. Cornell Univ., Am. Mus. Nat. Hist.; *hanno hanno prox.*, prep. 576, "Rio, Brazil, I-1875"; prep. 577 "São Paulo, Brazil,

¹ The occurrence of this species anywhere north of Arizona or the Carolinas (and even there the colonies would probably die out if not regularly replenished by the offspring of new arrivals) is due to direct spring immigration from the south in suitable seasons, which in its turn produces a more or less nomadic summer generation or generations. The same refers to *isola*.

V, *leg.* Bruno Pohl" and prep. 532, ♀, same; *hanno bogotana* Draudt, prep. 602, "Cota, n. Bogota, Colombia, 2,600 m. alt., 28-VIII-1938, *leg.* T. Hallinan" *ex coll.* Am. Mus. Nat. Hist.; *hanno watsoni* Comstock-Huntington, paratype, prep. 569, "San Juan, Puerto Rico, 11-14-II-1914"; other *hanno* forms: prep. 537^a, "Suapura, Venezuela, 27-VI-1899" *ex coll.* Weeks (strikingly resembling on the underside a specimen of *Chilades galba* Lederer from Daghestan, Russia); prep. 615, "Cari-puto, Venezuela, 23-III-1942," *ex coll.* Am. Mus. Nat. Hist.; prep. 517, "Chulamani, Bolivia, 28-XI-1898" *ex coll.* Weeks; prep. 518, "Coroico, Bolivia, V-1899," *ex coll.* Weeks; prep. 600, "El Volcan Chiriqui, Panama, 3-III-1936, *leg.* F. E. Lutz," *ex coll.* Am. Mus. Nat. Hist.; prep. 512, "Taboga Is., Panama, 3-I-1935, *leg.* M. Bates"; prep. 511, "Barro Colorado, Panama, 2-II, *leg.* M. Bates" (strongly pigmented, with broad vadium occupying 20 scale lines in forewing); prep. 568, "Martinique"; prep. 498, "La Vista and vic., La Selle Range, Haiti, 5-7,000 ft. alt., 16-23-IX-1934, *leg.* M. Bates" (with a MS note by Mr. Harry Clench questioning its belonging to "*hanno filcnus*").

Differing from *ceraunus* as follows: ædeagus shorter; suprazonal portion shorter in relation to subzonal; both slightly thicker; suprazonal tapering more distinctly; broadening more strongly at vesical part; spinules smaller, even the median ones hardly reaching 0.007; surculi much more developed, reaching 0.06 in length; of a quite different shape, *i.e.*, strongly incurved, both quite distinct in profile; sagum consisting of a single short, leaf-like, incurved lobe of a rather thick texture, apparently formed by a fusion of the alulæ; falx and uncus lobe smaller; forearm somewhat more tapering; elbow rounder; shoulder considerably weaker (smaller, lower, rounder); valve smaller; rostellum longer (up to 0.5 long); different in shape — thinner, tentacle-like, sinuous, more or less strongly and evenly arched, without any break in its curve; mentum more prominent, shoe-shaped; lower margin of valve (processus inferior) very curiously chiselled: abruptly broadening (basad from mentum) midway, almost at right angles to the length of the valve, thus forming a kind of keel, its steep distal edge reaching a "vertical" length of 0.08 in some specimens.

Female: ventral lamella of fibula shorter (0.1) and broader (0.3) than in *ceraunus*.

Measurements (in mm.): ædeagus 0.70 0.95, suprazonal portion 0.36–0.52 (mean 0.48), subzonal portion 0.3 0.46 (mean 0.40), with mean breadth 0.11 (in lateral view), penis mean 0.73; furca mean 0.19; sagum mean 0.27. Vertical Horizontal extension of uncus: forearm 0.15/0.022 to 0.24 0.045 (mean 0.2/0.035), humerulus mean 0.07 0.12, shoulder mean 0.1/0.06, lobe 0.19/0.045 0.26/0.06 (mean 0.24/0.05). Valve: 0.53–0.68 (mean 0.6) with breadth 0.24–0.36 (mean 0.3).

The length of the suprazonal portion of the ædeagus is very constantly around 0.5 in most of the sixteen males measured, gradually reaching 0.52 in a large Bolivian specimen (prep. 517) and in the Bogota one, but abruptly falling to 0.4 in the Cariputo specimen and to 0.36 in the (small) Martinique one. In the latter the suprazonal portion is shorter than the subzonal one (0.46), a ratio not met with in any other specimen; it would be interesting to see whether this applies to a special Martinique race, or is merely the result of irregular dwarfing in this particular individual. The subzonal portion is fairly constant at around 0.39, reaching 0.46 only in the above mentioned specimen and in the Surinam one, and falling to 0.3 in the Cariputo individual. The length of the forearm remains steadily at 0.21 in the majority of the specimens, rising to 0.22 in two (Surinam and Puerto Rico) and to 0.24 in one, but falling to 0.15 in the Cariputo specimen (where the whole armature is greatly reduced in size) and to 0.19 in a dwarf measuring 7 mm. from base of Cu to end of M_1 of forewing (Bolivia, prep. 518) as well as in another (smallish) individual from São Paulo. For the horizontal extension of the humerulus and for the height of the uncus lobe, 0.12 and 0.24, respectively, are the most frequently met measurements, with the humerulus steadier than the lobe which is much more sensitive in its reaction to the vertical growth or dwarfing of the forearm. The valve reaches 0.68 in my only Haitian specimen, but otherwise is very constant at close to 0.6, dwindling to 0.58, 0.56, and 0.53 in the small specimens from Martinique, Taboga, and Coroico.

Hemiargus ramon Dognin

(figs. RAM, pl. 4)

Two males investigated (both in Mus. Comp. Zool.): prep. 573, "Quayaquil, Ecuador, V-1924," ex coll. Weeks, and prep. 616, "San Rafael, Ecuador, VII-1919, leg. E. W. Rorer."

Suprazonal portion of ædeagus of the *ceraunus* type but considerably longer,¹ asparagus-like, of even breadth throughout after tapering at about one third from zone. Point of surculi in profile of the *ceraunus* type but still smaller (hardly 0.01). Ventral spinules very minute (less than 0.005). Sagum as in *hanno*. Falx of the *hanno* type but larger, heavier, with the shoulder still less pronounced. Valve of the *hanno* type, with deeply but rather roundly carved out lower margin and a somewhat straighter, slightly thicker rostellum.

Measurements: ædeagus 1.22–1.24, suprazonal portion 0.75, subzonal 0.47–0.49 with breadth 0.1–0.14; penis 1.05–1.1. Furca 0.23. Sagum lobe 0.21 with breadth 0.1. Vertical/Horizontal extension of uncus: forearm 0.25/0.055–0.29/0.06, humerulus 0.065/0.15–0.08/0.15, shoulder 0.1/0.07, lobe 0.21/0.07–0.23/0.06. Valve 0.62–0.65 with breadth 0.34–0.35.

Echinargus n.g.

(figs. ISO, N.S.P, pl. 5, 7; n.sp., pl. 8)

Type: *Lycæna isola* Reakirt 1866.

Two species known, one unnamed:

isola Reakirt (*Lycæna*, 1866, Proc. Acad. Nat. Sci. Philadelphia 1866:332, "Vera Cruz, Mexico"; *Hemiargus isola*, Bethune-Baker, 1916, Ent. News 27:450);

and a new species,² from Trinidad, British W. Indies.

GENERIC DESCRIPTION

Ædeagus shorter and weaker than in *Hemiargus*, intermediate in shape between *Hemiargus* (*hanno*) and *Cyclargus*; much plainer in structure, however, than in either, with very minute cornuti on the similarly shaped vesica. Suprazonal sheath shorter than the subzonal one, weakly notched ventrally, acuminate laterally, with high, rather distad facing vesical

¹ This is the longest ædeagus in *Plebejinæ* except *Aricia isaurica* Staudinger which is subequal, and *Icaricia icarioides* Boisduval which attains the enormous length of 1.75. Incidentally, in Chapman 1916, l.c., the former species (pl. 29, fig. 2, ædeagus) is wrongly figured as *Albulina pheretes* auct. (*orbitulus* Prunner) and vice versa (pl. 30, fig. 4, ædeagus).

² Shortly after recognizing this as an undescribed species by studying the Thaxter pair (see below), I learnt from Mr. W. P. Comstock that he knew it already from specimens (one of which he gifted to this Museum) taken on the same island by Mr. E. I. Huntington, and was about to publish it. I refrain from using Comstock's MS. name so as not to interfere with his priority in case my paper appears before his.

opening and small alulae at the zone. Furca larger or much larger than in *Hemiargus*. Sagum considerably more developed (and reaching in *isola* its maximum for the whole subfamily), consisting of two, ventrally scooped out or fully formed lobes aproning the ædeagus and armed with a set of teeth along the distal part or the whole of the margin. Forearm of falx very slightly curved and sharper than the straight blunt forearm of *Cyclargus* or *Hemiargus*, with a higher and more conical shoulder. Uncus lobe as in *Hemiargus* but slightly more excurved and tending to a hatchet shape under pressure. Valve of a normal subfamilial (fish-like) shape, allied to the *lajus* section in *Chilades*, with a tapering rostellum of the *Hemiargus ceraunus* type but differing from those genera by the presence of a bullula which is typical for holarctic *Plebejina* (and also exists in the next three neotropical genera to be discussed). Female: henia long and comparatively thin, thus again differing from *Hemiargus* in a normal "Old-World" direction.

Echinargus isla Reakert

(figs. 150, pl. 5, 7)

Seven males and one female investigated:

Prep. 540, "Tancitaro, Michoacan, Mexico, 6,000 ft., on *fæccs*, 10-VII-1941, leg. R. Haag: 539 (forma "*nyagora* Boisduval") *id.*; 478, "Round Mt., Texas, X-1930," *ex coll.* Fall; ♀ 587, "Dallas, Texas, leg. Boll"; 500, 526, 534, "Texas"; 538, "Half Way House, Pike's Peak, Colorado, 9,000-10,000 ft., 16-18 VII-1902," *ex coll.* Weeks (? *ssp. alce* Edwards; see Field 1941, Kans. Univ. Sci. Bull. 26:347).

Ædeagus very poorly chitinised, very anemic looking when teased out of the prodigious structure of the sagum; just over two thirds of a mm. long, the suprazonal portion less than one third of the subzonal one with the vesical opening at two thirds from the zone. Furca extremely long,¹ almost reaching one mm.

¹ This is the only species of the nineteen discussed here that already had been (briefly) described genitally: namely, Bethune Baker 1916, *l.c.*, refers to "a large toothed hood . . . [which] has its origin just above the very short furca." Evidently the greater part of the *very long* furca was screened from the observer by other parts of the armature. In this connection it should be noted that during the time the armatures are studied they should be kept in vials and if mounted at all (subsequently) the parts should be well separated, with the dorsum placed in ventral view. A slide of the whole armature in lateral view (or a photograph of such a preparation) is utterly useless.

and thus of a very holarctic aspect. Sagum hugely developed, consisting of two convex lobes, in ventral view resembling the parietal bones of a skull; about twice as long as broad, only slightly shorter than the prongs of the flexible furca embracing them: thus twice longer than the subzonal portion of the ædeagus which they envelop from the zone down, their strongly serrated edges meeting in front (e.g. ventrally) of the ædeagus and of an imaginary line prolonging it proximad; these teeth of uneven length but on the whole increasing in size proximad; up to 45 teeth along each margin, the first three or four (at the most distal point where the edges begin to meet) about 0.012 long, then ranging (in the same specimen) from 0.02 to 0.04 (and to 0.055 in some specimens) in an unequal sequence; finally reaching 0.1 at the proximal ends of the parting margins where they become clawlike, with clusters of additional spines on the præmarginal surface of the lobes. Shoulder of falx almost as high as the forearm which is about one third of the ædeagus. Valve twice longer than the ædeagus and more than three times as long as broad itself with a long tapering tail, a rather weak hump, a small mentum and a curved rather than bent, thickish, gradually tapering rostellum about 0.2 long.

Female: henia beautifully developed with its distal half (about 0.6) strongly plated; fibula engulfed as it were in this chitinisation.

Measurements (in mm.): ædeagus 0.6–0.7 (mean 0.69), suprazonal portion 0.15–0.2 (mean 0.18), subzonal 0.45–0.52 (mean 0.49) with breadth (in lateral view) 0.08–0.09; penis mean 0.62. Furca mean 0.9. Sagum 0.85–0.96 (mean 0.93) with breadth 0.41–0.44 (mean 0.42). Vertical/Horizontal extension of uncus: forearm 0.2/0.03–0.22/0.035, humerulus 0.055/0.13–0.065/0.14, shoulder 0.18/0.05; lobe 0.25/0.08. Valve 1.28–1.31, with breadth 0.33–0.39.

Echinargus n.sp.

(figs. N.SP, pl. 5, 7, 8)

Two males and one female investigated: prep. 578, "Port of Spain, Trinidad, XII–1912–V–1913, leg. R. Thaxter," Mus. Comp. Zool.; female, prep. 597 *id.*; prep. 614, "Chancellor Rd., Port of Spain, Trinidad, 21–31–III–1929, leg. E. I. Huntington," *ex coll.* Amer. Mus. Nat. Hist., Mus. Comp. Zool.

Ædeagus just over half a mm. in length, the suprazonal por-

tion about three fifths of the subzonal one, vesical opening at about two thirds from zone on the ventral side. Furca longer than the subzonal portion of the ædeagus and very thin. Sagum very remarkable: showing a transitional stage of development between *Hemiargus ccranus* and *Echinargus isola*; each of its twin parts produced ventrad from the zone and embraced by the furca, in shape roughly resembling a high-shouldered falx the forearm of which (copied by the jutting lower portion of each lobe) would terminate in a process resembling a valval comb. For purposes of measurement this peculiar fig-leaf type of sagum may be imagined in the case of each lobe as a roughly equilateral triangle ZPD.¹ (where Z is the prazonal point, P the base of the penis and D the dentate end of each sagum lobe) with ZP (along the ædeagus) and PD (at an angle away from the ædeagus ventrad) and the imaginary line ZD connecting these points (and in position coinciding with the "filled out" ventral margin of each lobe in *isola*) each about 0.3–0.35 long. Actually a large portion (shaped rather like the falcate arch in high-shouldered falces) is left unfilled in the triangle ZPD so that each sagum lobe consists of an upper portion dorsally curving along the ædeagus, ventrally sinuous with a bulge in its outline, and roughly 0.35 long by 0.15 broad at that bulge, and of a lower portion, jutting in a ventral direction, 0.35 long along its straight basal side, 0.3 along its sinuous and oblique opposite margin and 0.04 broad at the beginning of its free part, then widening to 0.1, and at the very end narrowing again to form a spur 0.05 broad with four teeth 0.01 long. Falx and uncus lobe covered by the generic description and the measurements given below. Valve small but at least a fifth longer than the ædeagus, elongated, slightly more than twice as long as broad, with Bayard's angulation well pronounced. Rostellum bent towards the mentum, thin, tapering, about 0.11 long.

Female: henia extruding (semi-exserted) to a length of 0.25 by 0.12 broad medially in lateral view. Fibula consisting of two lamellate portions one longer by 0.04 than the other which is 0.17 long by 0.12 broad, of a suboval shape. Papillæ anales about 0.33 long by 0.42 broad, with rods 0.7 long.

Measurements (in mm.): ædeagus 0.56–0.58, suprazonal portion 0.2–0.21, subzonal 0.36–0.37 with breadth 0.1; penis 0.5. Furca 0.42–0.43. Sagum 0.35 (see description). Vertical/Hori-

¹ Which following the falcate simile would coincide with BHF (see pl. 1).

zontal extension of uncus: forearm 0.18/0.035–0.18/0.045, humerulus 0.04/0.12–0.045/0.14, shoulder 0.11/0.065–0.11/0.07, lobe 0.21/0.05. Valve 0.7 by 0.29–0.31 broad. Rostellum 0.11.

Alar characters, underside, ♀, (see plate 8): 0–150: number of concentric scale lines with common center for both wings (as also in *Cyclargus*). Veins ending at following lines: forewing Sc|65, R₁|85, R₂|100, R₃|120, R₄|140, M₁|145, M₂|145, M₃|143, Cu₁|137, Cu₂|128, 1A|124, 2A|118, hindwing Sc|78, R₁|94, M₁|108, M₂|110, M₃|110, Cu₁|108, Cu₂|100, 1A|94, 2A|85, 4A|40. The evenly rounded stretch of termen 94–108–110–110–108–100–94 is a rare character in *Plebejinæ* (also found in *Cyclargus*).

The following markings are represented: forewing, fairly broad terminal line, split macule I (with inner and outer cretules and uncolored interval) in cells R₁ to 1A, lateral macule in R₂, macule II (with broad halo) in R₁ to 1A, I discoidal R+M (with broad halo). Example of disposition (on interneural fold); in Cu₁: terminal line 133–136; outer cretule 127–133; præterminal mark (outer part of split macule I) 123–127; interval 116–123; semimacule (inner part of split macule I) 111–116; crescentic inner cretule 104–111 (thus the whole system of macule I extends from 104 to 133); outer part of halo of macule II 88–94; macule II 81–88; inner part of halo of macule II 76–81 (thus the whole system of macule II 76–94). Hindwing, fairly broad terminal line, split macule I (with crescentic inner and outer cretules; interval uncolored except in Cu₁) in cells Sc to 2A, poorly pigmented except the præterminal mark in Cu₁; macule II in same cells, macule III in Sc and Cu₂; I R+M and II M; lateral macule in 4A. Observations: præterminal marks in hindwing from Sc increasing tornad and together with the intervals tending to a triangular (basad pointed) shape, especially in M₂, M₃, weakly pigmented; then in Cu₁ greatly developed (20 scale lines), round, strongly pigmented ("black") with a distally placed band-like scintilla consisting of 52 scales and about a fifth the mark in extension (proximo distad), and a narrow crescentic interval faintly flushed with the auroral element; then in Cu₂ to 2A mark roundish, but small, decreasing tornad, weakly pigmented. Other catochrysopoid features, shared with *Cyclargus* and *Hemiargus*, can be easily seen from the figure.

Pseudolucia n.g.

(figs. CIII, COL, pl. 5)

Type: *Lycæna chilensis* Blanchard 1852.

Two species known:

chilensis Blanchard (*Lycæna*, 1852, in Gay, Hist. Chile, Zool. 7:37-38, "Coquimbo, Chile," pl. 3, figs. 4a ♂, b; *Scolitantides chilensis*, Butler, 1881, Trans. Ent. Soc. 1881:467; ?*Lycæna endymion*¹ Blanchard, 1852 *ibid.*:37 "Coquimbo, Chile," pl. 3, fig. 3a ♂, b; *Polyommatus atahualpa* Wallengren, 1860, Wien. ent. Monatschr. 4:37, "Valparaiso, Chile").

collina Philippi (*Lycæna*, 1860, Linn. Ent. 14:270-271 "Santiago, Chile"; *Scolitantides*² *collina*, Butler, 1881 l.c.; *Lycæna lyrnessa* Hewitson, 1874, Ent. Month. Mag. 11:107 "Chile").

GENERIC DESCRIPTION

Ædeagus thick-set, with strong fat tabs and alulæ, the latter very homogeneous with the subzonal sheath, sepuloid, arched and raised (as in several suprazonally short palæarctic genera e.g. *Agrodiaetus*), the zone dipping medially (ventrally slightly more so than dorsally) and coinciding with the beginning of the vesical opening on the dorsal side. Suprazonal portion, as measured from that medial point ventrally, extremely short, about one third the length of the subzonal one (and still shorter if measured from the apices of the "shrugged" alulæ), thus shorter than in any other species restricted to the New World. The short shield of the (ventral) suprazonal sheath deltoid in ventral aspect, acuminate in lateral view and quite straight i.e. lacking the slight excurvation noticeable in *Hemiargus*, *Cyclargus* etc.; exceeding in length the plain unarmed vesical tip of the penis (which seems sunken between the alulæ). Subzonal sheath thickly lining the penis, curiously shagreened ventrally. Furca strongly developed, its tips connected with the sagum. The latter in shape and position of the *Echinargus isola* type, but considerably smaller (in relation to the ædeagus), its two lobes reaching from the level of the alulæ (to which they are

¹ Rechristened "*sibylla*" by Kirby (1871, Cat. Diurn. Lepid.: 377) who wrongly thought Blanchard's name clashed with *Papilio endymion* [Schiff] = *Meleageria meleager* Esper.

² The genus *Scolitantides* Hübner, of which *orion* Pallas is the type, belongs to the *Glaucopteryx* group. By an amusing coincidence Butler placed almost correctly in that genus the species *plumbea* described *ibid.*

attached) to the level of the base of the penis proper and almost as broad as long; meeting in front (i.e. ventrally) of the ædeagus at about one third of the subzonal portion from the zone, overlapping for a short stretch, then parting again; these front edges coarsely serrated, and the whole præmarginal portion of each lobe strengthened ventrally by an additional sharply localized granulation of the chitinous surface (similar to the shagreened ventrum of the ædeagus as seen in the V-shaped anterior parting of the lobes), a character not found elsewhere in the subfamily. Uncus small, resembling *Pseudothecia* and also the unique plebejinoid uncus¹ of the holotropical *Zizula gaika* Trimen (*Lycæna cyna* Edwards) in *Brephidina*. Falx still more curved than in *Echinargus*, differing from *Hemiargus* as a beckoning index does from a warning one; the whole outline from point of forearm to base of humerulus evenly rounded, with a gently sloping shoulder, thus quite different from the "cameloid" falces of the three preceding genera. Uncus lobe still more tending to a hatchet shape than in *Echinargus* (and thus resembling *Eumedonia*). Valve of a typical holarctic shape, with bullula; elongated, nicely angled at Bayard's point, rather exactly three times as long as broad and at least twice longer than the ædeagus, with a sparsely serrated rostellum.

Female: henia long and thin, with a plate-like chitinisation at the tip.

Pseudolucia chilensis Blanchard

(figs. CHI, pl. 5)

Three males and one female (all ex coll. Weeks, Mus. Comp. Zool.) investigated: prep. 619, "Central Chile, 1882-1885, leg H. B. James"; 485, 534, "Penco, Chile"; ♀ 533, *id.*

Rostellum about 0.2 long by 0.03 broad (at curve), incurved as in *Echinargus isola* but serrated *i.c.* ending in a beak-like tip, its inner margin concave (fitting the upper, convex, margin of the mentum in situ), its outer (distad facing) edge below the curve sparsely toothed: four teeth in all counting the "heel" of the abrupt curvature as first, the two next slightly larger and slightly incurved projections as second and third, and the beak of the rostellum as fourth. Other male characters covered by

¹ This and the *Catochrysopina*-like features of the *Parachilades* (and less distinctly *Chilades*) falx constitute the only two links between the *Plebejinæ* and other subfamilies.

the generic description and the specific measurements given below.

Female: henia found extruding at a length of 0.45 from tip of body; ostium strengthened by a post vaginal lamella attaining a dorsal length of 0.25 and a lateral one of 0.38 (basad). Papillæ anales: length about 0.45 by 0.4 broad. Rods comparatively short, 0.7.

Measurements (in mm.): aedeagus mean 0.65, suprazonal portion (see also generic description) 0.15-0.18 (mean 0.16), subzonal 0.48-0.53 (mean 0.5), breadth (in lateral view) 0.12; penis 0.56. Furca 0.7-0.9. Sagum (mean) length of lobe 0.48 by 0.42 broad; breadth of granulation 0.1; average length of teeth 0.03. Vertical/Horizontal extension of uncus: forearm 0.21/0.04-0.25/0.05, humerulus 0.05-0.21-0.06-0.21, shoulder 0.11/0.12, lobe 0.2/0.07-0.23/0.07. Valve 1,3-1.4 with breadth 0.45-0.48: teeth (first three measured from tip to a level prolonging basad the anterior edge of each next): first 0.005, second 0.006, third 0.003, fourth (to junction with third) 0.04.

Pseudolucia collina Philippi

(figs. COL, pl. 5)

Prep. 536, "Penco, Chile," ex coll. Weeks, Mus. Comp. Zool.; female 591, id.

Differing from *chilensis* in greatly reduced size (except as regards the height of the shoulder, as will be seen by referring to the measurements given below) and in the presence of an additional strip of shagreened chitinisation running along the outer margin of each sagum lobe and proximad converging, but not actually fusing, with the similar granulation along the serrated inner edge. Rostellum thin, whip-like, very similar (in miniature) to the *lajus* group in *Chilades*, very weakly curved, however, and only slightly exceeding the mentum in length (*in situ* resting upon the bullula), about 0.02 broad, not curving and broadening at the tip (as it does in *chilensis*) except for a slight rosette-like expansion due to four somewhat up-turned teeth, the first about 0.01 long, the two next gradually diminishing, the last barely indicated.¹

Female: henia found jutting to a length of 1 mm. (by about

¹ I do not think I have failed to unfold the tip properly, but still its serration should be checked on more material.

0.07 broad) from the tip of the body. Lamella 0.2 long laterally, twice shorter dorsally.

Measurements (in mm.): ædeagus 0.43, suprazonal portion 0.11, subzonal 0.32 with breadth (in lateral view) 0.06; penis 0.4, furca 0.5, sagum about 0.3 by 0.2. Breadth of inner granulation 0.9, with average length of teeth 0.01; breadth of outer granulation about 0.4. Vertical/Horizontal extension of uncus: forearm 0.14/0.03, humerulus 0.045/0.16, shoulder 0.11/0.09, lobe 0.2/0.06. Valve 1 with breadth 0.33; teeth 0.01 and smaller.

The high development of the auroral element in the ground of *chilensis* and *collina* is approached among the *Plebejinæ* only by the upperside of the Sonoran *Plebulina emigdionis* and by the intense coloration of the forewing underside in certain individuals of the Spanish *Aricia idas* Rambur (rechristened at one time "*ramburi*" by Verity).¹ The upperside of the females oddly recalls certain Australian *Lycænids* belonging to a widely different subfamily.

The underside maculation in *chilensis* is of a dispositional type frequently met with in *Plebejinæ* (and *Glaucopsychinæ*); the tendency on the part of the II macules in forewing to assume a very distal position (quite normal of course in the case of Cu_1+1A) as well as the rather proximal ("glaucopsychoïd") position of R_4 II in hindwing and the weak pigmentation of the I (split) macules, with an aurora visible only in Cu_1 of hindwing (in some specimens but absent in the female type), occur in several palæarctic and nearctic species of both subfamilies. The insulæ and outer cretules are conspicuous on the upperside of the male and are still more conspicuous in Blanchard's figure of *endymion* which on the whole differs from *chilensis* only in being rather thoroughly dusted with blue structural scales (that are sparsely represented basally and along the hindwing dorsum in one of my males of *chilensis*). In my specimens of *collina* (a much smaller species) the distal position of the II macules R_4 to Cu_1 is still better marked and I RM (weak in *chilensis*) is quite absent — a rather unusual character. In the hindwing, however, where II macule R_4 is as proximal as in *chilensis* the resemblance to the latter species abruptly stops at that interspace: the posterior rest of the wing produces in con-

¹ One would like to suggest that in the future no such renaming, however necessary, should be valid unless the author of the new name redescribes the species or subspecies and selects a holotype

trast to the rather *Plebejus sœpiolus*-like wing of *chilensis* a remarkable homoptic or mimetic resemblance to *Itylos* and especially to *Parachilades* owing to a combination of seven characters: 1. enlarged, more or less cordate shape of median and posterior II macules; 2. their transverse development and connection; 3. the oblique line into which II macules M_2 to 2A fall; 4. the blurred pigmentation; 5. the weakness of the I macule system; 6. the fusion of distal parts of halos with proximal cretules; and 7. the great development of coarse greyish white scales.

Scolitantides plumbea Butler 1881 (Trans. Ent. Soc. 1881:486, "Chile") which is possibly the same as *Lycæna patago* Mabille 1889 (Nouv. Arch. Mus. Paris 1:143-144 "Punta-Arena" pl. 10, fig. 1 ♂, 2) belongs to a different subfamily, being structurally the only representative of *Glaucopsychinæ* in S. America. *Scolitantides andina* Calvert 1894 (An. Univ. Chile 34:832, "Condes above Santiago"; Elwes 1903 Trans. Ent. Soc. London 1903:288-289) may prove to be a synonym of *plumbea* too.

Paralycaides n.g.

(figs. INC, pl. 6)

Type and only species known: *Itylos inconspicua* Draudt 1921, (*in* Seitz, Macrolep. World 5:822, "Cuzco, Peru," pl. 144, m).

One male investigated: prep. 607 "Cuzco, Peru, 3500 m. alt., leg. Fassl," *ex* coll. W. P. Comstock, [*ex* coll. Staudinger-Bang Haas, "vapa Stgr"], Amer. Mus. Nat. Hist.

Extremely close to *Lycæides*, in the falx, furca and valve, and considered here as retaining an ancestral aspect of that genus. *Ædeagus* resembling *Pseudothecia*, thickish subzonally, very slightly incurved, just above 0.8 long; differing from *Lycæides* in the suprazonal portion being twice shorter than the subzonal one and in the higher (at about 0.1 above zone), and thus shorter, vesical opening (the lower point of which is at the zone in *Lycæides*). Vesica unarmed; suprazonal sheath tapering to a point ventrally. Furca very large, equal in length to the *ædeagus*, larger than in *Lycæides* (especially in relation to the other parts of the armature, less so in absolute size). No definite sagum but traces of a membrane between furca and subzonal sheath. Falx of the "plain type" with an outline nicely

rounded throughout, remarkably resembling *Lycæides argyrog-nomon* Bergstrasser (Tutt) in miniature, less distinctly hooked at the tip; distance between point of forearm (F) and posterior point of shoulder (U) equal to that between the latter point and the tip of the uncus lobe (in ventral view); forearm short, shorter than the humerulus, the latter medially not thicker than the former, then very gradually thickening to form a low sloping shoulder with a rather ill-defined basal point. Uncus lobe resembling *Hemiargus*, i.e., poorly developed; thus smaller, narrower and slightly more excurved than in *Lycæides*; in height (length) when measured in the same way as the rest of the genera here treated (i.e., from its tip to the basal point of the humerulus) equal to the humerulus but if measured according to the method adopted for *Lycæides* (i.e., from its tip to the posterior point of the shoulder) considerably less than the humerulus (HU) and somewhat less than the forearm (FH). Valve of the *Lycæides* (and *Freyeria*) type, smallish as compared to *Lycæides*, one and a half times longer than the ædeagus, about twice as long as broad; rostellum narrower in relation to the valve than in *Lycæides*, not exceeding the mentum in length, slightly and evenly expanding at the tip to form a comb consisting of a dozen teeth, each about 0.0065 in length, i.e. longer than in *Freyeria putli* Kollar [Moore] (0.0025), shorter than in average *Lycæides* (0.009), and directed as in those genera (as well as in *Cyclargus*) at right angles to the transverse axis of the rostellum.

Measurements (in mm.): ædeagus 0.82; suprazonal portion 0.27; subzonal 0.55 with breadth 0.15 (in semilateral view); penis 0.66. Furca 0.83. Vertical/Horizontal extension of uncus: forearm 0.22/0.05, humerulus 0.05/0.24, shoulder 0.11/0.15, lobe 0.24/0.075. When the uncus is measured according to the method used for *Lycæides* (see pl. 1, fig. 3, pl. 6, INC 2, and 1944, *Psyche* 51:108-111, fig. 1) the triangle FHU gives $0.22 + 0.24 + 0.17 = 0.63$. These figures come rather close to the dimensions ($0.25 + 0.22 + 0.22 = 0.69$) of the hypothetical ancestor of *Lycæides* as worked out (1944, l.c.) prior to the discovery of the structure of *inconspicua*. Valve 1.2 with breadth 0.53; comb 0.061 broad.

In regard to macroscopical characters it may be briefly noted that the wing-shape recalls that of small arctic or high alpine forms of *Lycæides* while the pattern of the underside (very

proximal position of II macule $Cu_2 + 1A$ in forewing and II macule M_1 in hindwing, poverty of pigmentation of macules, strong development of halos and other colorless scales) belongs to the same phase, as traversed by the structurally very different genus *Itylos* (s.s.).

Itylos Draudt [revised]

(figs. MOZ, RUB, PAC, KOA, pl. 6; MOZ, KOA, pl. 7)

At the end of a jumble of species and forms belonging really to several genera and subfamilies but all crammed into "genus *Lycæna* F, subgenus *Rusticus* Hbn" (whatever that means), Draudt (1921, in Seitz, *Macrolep. World* 5 : 818) said of *Lycæna ruberrothci* Weeks ["English" text]: "Perhaps better to be placed to *Itylos* beside *moza* and *inconspicua*." This is the first time the genus *Itylos* is "indicated." A few pages further (: 821) *Itylos* Draudt was superficially described and made to include *pelorias* Weymer, *pacis* [Staudinger in commerce] Draudt, *koa* Druce, *vapa* Staudinger [*sp. incert.*], *ludicra* Weymer [*id.*], *moza* Staudinger, *inconspicua* Draudt [*recte Paralyceides sp., supra*], *titicaca* Weymer [*recte Parachilades sp., supra*] and *speciosa* Staudinger [*id.*]. Regarding the two last, however, Draudt said (: 822) that they belonged to "a somewhat deviating group." Under the circumstances, i.e., since *speciosa* Staudinger [= *titicaca* Weymer] is not mentioned in the original list of *Itylos* species (*ruberrothci* Weeks [*fortas.*], *moza* Staudinger and *inconspicua* Draudt [*nom. nud.* at the time]) and is only doubtfully assigned to it when the genus is more fully discussed subsequently, Hemming's selection of *speciosa* Staudinger as the type of *Itylos* (1929, *Ann. Mag. Nat. Hist.* 3: 240) cannot stand.

Type: *Cupido moza* Staudinger 1894.

Four species known:¹

moza Staudinger (*Cupido*, 1894, *Iris* 7: 79-80, "Cocapata and Huallatani, Bolivia"; *Lycæna*, *ibid.* pl. 2, fig. 5 ♀; *Itylos moza*, Draudt 1921, *op. cit.*: 818 et: 821; *Lycæna babhru* Weeks, 1901, *Trans. Am. Ent. Soc.* 27: 357, "Sicasica, Bolivia"; 1905, *Unfig. Lep.* : 98, pl. 43, fig. 1 [♀]);

ruberrothci Weeks (*Lycæna*, 1902, *Ent. News* 12: 104 "Sicasica, Bolivia," 1905 *op. cit.* : 99, pl. 43, fig. 2 [♂]; *Itylos*?, Draudt 1921, *op. cit.* : 818);

¹ Listed in systematic sequence.

pacis Draudt (*Itylos*, 1921, *op. cit.* : 821, "Cuzco, Peru," pl. 144, 1, *pacis* ♂ ♀; ?*Lycæna pelorias* Weymer 1890, in Reiss et Stübel, Reisen in Sud-America, Lepidoptera : 121-122 "Sajama, Bolivia," pl. 4, fig. 2 ♂);

koa Druce (*Lycæna*, 1876, Proc. Zool. Soc. London, 1876 : 239-240, "Pozuzo, Peru," pl. 18, fig. 7 [♂]; ?Weymer, 1890, *op. cit.* : 49 "Antisana, Ecuador"; *Itylos*, Draudt, 1921, *op. cit.* : 821 pl. 144, m; [see also "*Lycæna koa*," Dyar, 1913, Proc. United States Natul. Mus. 45 : 638, who suggests seasonal dimorphism in the tone and density of the blue overlay in Peruvian males].

My study of the bibliography has been very superficial and my material too scanty for a satisfactory revision of these little known species. *Lycæna ludicra* Weymer 1890 (*op. cit.* : 122, "Tacora, Bolivia," pl. 4, fig. 3 ♂) may be a form of *Itylos moza*, or an allied species, with well developed cyanic overlay, and *Itylos grata* Kohler 1934 (Rev. Soc. ent. Argentina 6 : 38-39 "Las Lajas, Argentina," text fig. [poor phot.] ♂) is apparently close to *pacis* Weymer. *Cupido vapa* Staudinger 1894 (Iris 7 : 79, "Huallatani; Cocapata, Bolivia"; *Lycæna vapa*, *ibid.* pl. 2, fig. 4 ♂) may turn out to belong to *Itylos*, and the same may be said of *Lycæna martha* Dognin 1887 (Le Naturaliste 9 : 190, "Loja, Ecuador"), which, judging by the woodcut (l.c. fig. 5 ♂ ♀) combines *Hemiargus* and *Itylos* wing characters and very possibly is a form of *koa* (some specimens of which have a well formed, "black," scintillated præterminal mark in Cu₁) with strongly developed ornamentation of the catochrysopoid type.

GENERIC DESCRIPTION

A very holarctic looking genus. *Ædeagus* acuminate, slightly incurved, in structure and shape closely allied to *Icaricia*, *Aricia*, and *Lycæides*. Suprazonal portion subequal to the subzonal one; suprazonal sheath in ventral view rather narrow above the zone, then slightly broadening, then tapering to a sharp point, and (in side view) laterally enveloping the vesica only immediately above the zone, then gradually turning into a strictly ventral shield. Vesical opening on the dorsal side beginning immediately above the zone, vesica plain, weakly convex, about as long as the subzonal sheath. Alulæ small. Furca well developed. Sagum absent. Falx resembling an enlarged edition of

Cyclargus; somewhat allied to *Aricia* but well formed, with a steeper and narrower shoulder. Forearm straight, tapering to a blunt point, falcate arch narrow, shoulder high and conical though not as high in relation to the falx as it is in *Echinargus*. Uncus lobe with *Albulina* affinities, larger than in all preceding groups considerably higher than the forearm. Structure of tegumen at its junction with the uncus more elaborate, than in the preceding genera, of a common holarctic type (*Albulina*, *Plebulina*, etc.). Valve likewise representing the holarctic norm, longer than the ædeagus, with a well developed bullula. Rostellum, broader than in *Aricia*, serrated, exceeding the mentum in length, differing from *Paralycaides* in the latter character as well as in the receding margin of the comb, the sharp regular teeth of which are directed downward.

Papillæ anales with comparatively short rods. Henia well developed, with an oval fibula (*koa*) somewhat resembling *Aricia*.

Itylos moza Staudinger

(figs. moz, pl. 6, 7)

One male investigated: prep. 606, "Bolivia" ex coll. Huntington [ex coll. Staudinger-Bang Haas], Am. Mus. Nat. Hist., and one female: prep. 528 (*Lycæna babhru* Weeks, holotype), "Sicasica, Bolivia, 1-X-1899," ex coll. Weeks, Mus. Comp. Zool.

Ædeagus 1 mm. long with the suprazonal portion slightly shorter (by about 0.1) than the subzonal one. Furca about equal in length to the penis. Forearm a third of the length of the ædeagus, about ten times as long as broad, thus rather thin; humerulus thick, about a third of the forearm in height, and rising to double of that at the shoulder; uncus lobe very slightly incurved, as long as the suprazonal portion of the penis, less than a fourth of that broad, somewhat expanding above the level measured, then gradually tapering to a rather well accented point. Valve large, about one and a half times longer than the ædeagus when measured from the base to the end of the rostellum and less than half as broad as long, with the hump at about two thirds of the length of the upper process from the base of the valve.

Measurements (in mm.): ædeagus 1, suprazonal portion 0.44, subzonal 0.56 with breadth (lateral view) 0.11; penis 0.94. Furca 0.93. Vertical/Horizontal extension of uncus (ventral

view): forearm 0.34/0.03, humerulus 0.09/0.2, shoulder 0.17/0.06, lobe 0.44/0.1. Valve 1.35 (to comb 1.55) with breadth 0.59; average length of teeth 0.01.

Itylos ruberrothei Weeks

(figs. RUB, pl. 6)

Two males investigated (Mus. Comp. Zool.): holotype, prep. 527, "Sicasica, Bolivia, 1-X-1899" (left forewing missing), and paratype, prep. 486, "Alezum, Bolivia, 8-VIII-1899," *ex* coll. Weeks.

Identical in structural shape with *moza*,¹ differing from it only in slightly reduced size (cp. measurements) of ædeagus, furca and uncus, and narrower (cp. to length) valve. Valve variable in length, reduced in the holotype, but equal to *moza* in the other individual.

Measurements (in mm.) [when different the holotype is quoted first]: ædeagus 0.9, suprazonal portion 0.4; subzonal 0.5 with breadth in lateral view 0.1, in ventral 0.08; penis 0.8. Furca (holotype) 0.7. Vertical/Horizontal extension of uncus: forearm 0.24/0.03 and 0.29/0.05, humerulus 0.07/0.12 and 0.07/0.17, shoulder 0.13/0.055 and 0.14/0.05, lobe 0.37/0.8 and 0.4/0.09. Valve 1.14 (to comb 1.24) and 1.35 (to comb 1.55) with breadth 0.41 and 0.5. Average length of teeth 0.01.

Itylos pacis Draudt

(fig. PAC, pl. 6)

One male investigated: prep. 609 "Cuzco, Peru, 3500 m. alt., *leg.* Fassl," *ex* coll. W. P. Comstock [*ex* coll. Staudinger-Bang Haas], Am. Mus. Nat. Hist.

Differing from *moza* and *ruberrothei* in the following characters: somewhat thicker forearm, smaller and shorter valve,

¹ Quite possibly more material would show that *ruberrothei* is but a form (individual, altitudinal, or microlocal) of *moza*, similar variations in structural size occurring in other alpine species (e.g., *Agriades glandon*). I have assigned the female specimen (described as *habhru*) to *moza* on macroscopical grounds, the difference between the two consisting solely in *ruberrothei* being less robust in wing shape and less pigmented than *moza* (with otherwise identical underside markings, the presence of which on the hindwing of *ruberrothei* may be easily discerned by means of lens, but has been overlooked both by the describer and artist). Staudinger mentions some very weakly marked specimens in his series of *moza*.

rather medial position of hump, shorter (comparatively to mentum) rostellum and conspicuously longer teeth.

Measurements (in mm.): ædeagus, 0.95, suprazonal portion 0.45, subzonal 0.5 with breadth (lateral view) 0.12; penis 0.85. Furca 0.7. Vertical/Horizontal extension of uncus: forearm 0.29/0.05, humerulus 0.06/0.2, shoulder 0.15/0.06, lobe 0.4/0.9. Valve 1.1 (to comb 1.2) with breadth 0.44; average length of teeth 0.017.

Itylos koa Druce

(fig. KOA, pl. 6, 7)

Two males and one female investigated (Mus. Comp. Zool.): prep. 592, 595 and 593 female, "Puno, Peru, 12,500 ft. alt., 1-XI-1898" *ex* coll. Weeks.

Separated in uncus and valve from the precedent structures by a wider hiatus than that existing between *moza* and *ruber-rothei* on one hand and *pacis* on the other. Ædeagus slightly shorter and thinner than in *pacis*, furca slightly longer. Forearm shorter, rather thicker at its base, then tapering, shoulder smaller, uncus lobe about six times as long as broad, much narrower throughout than in the other species. Valve smaller, rather proximally humped, hardly more than half as long as broad, only slightly longer than the ædeagus, with a correspondingly reduced comb, very minutely serrated, the teeth a third shorter than in *ruber-rothei*.

Measurements (in mm.) [when different, 592 quoted first]: ædeagus 0.84 and 0.8, suprazonal portion 0.42 and 0.4, subzonal portion 0.42 and 0.4 with breadth (lateral view) 0.08; penis 0.8 and 0.75. Furca 0.76. Vertical/Horizontal of uncus: forearm 0.23/0.05 and 0.25/0.05, humerulus 0.08/0.13 and 0.1/0.17, shoulder 0.13/0.05 and 0.17/0.06, lobe 0.31/0.06 and 0.3/0.055. Valve 0.9 (to comb 1) with breadth 0.41 and 0.42; average length of teeth 0.004.

The "vitta" of British authors is a certain combinational pattern element occurring on the hindwing underside of a number of Palæarctic *Plebejinæ* (and especially conspicuous in certain *Agrodiætus* species). It is made up of halo and cretule fusions and can be divided into four phases of development: 1. halo M_2 (its posterior distal part) and cretule M_2 fuse in the posterior part of the cell, *i.e.*, below the interneural fold in M_2 , the resulting white streak occupying the whole space between the fold

and vein M_3 ; 2. a similar somewhat weaker fusion is added (not occurring alone) in the anterior part of cell M_3 and blends along vein M_3 with the fusion in the posterior part of cell M_2 ; 3. halo IM (lower part of first discoidal) fuses with halo M_2 which is fused with cretule M_2 ; 4. halo IIM is also involved, this producing a white comet tail traversing most of the wing, "splitting" it longitudinally and widening distally (owing to fusion 2). When, as often happens in *Agrodiætus* the rest of the halos and cretules are reduced while the median macules themselves are "dissolved," so to speak, in the vitta, the effect is very striking. In *Itylos* the vitta effect is produced quite differently and may be termed a *pseudovitta*. At its full development it is formed by the fusion of the halos and cretules in M_3 , CU_1 , CU_2 , and IA, and would not be distinguishable from similarly formed blendings in *Lycæides*, *Cyclargus*, etc., had not the following three factors been present: 1. owing to the very proximal ("lagging") position of second macule M_3 the fusion is lengthened in that cell; 2. together with the shorter fusions in the cubital cells it forms an elongated shiny white mark sub-parallel to the costa; 3. this blending is especially conspicuous because absent in M_2 and M_1 .

CONCLUSIONS

The following general remarks may be added. Of the nine neotropical genera none occur elsewhere. Three, namely *Parachilades*, *Paralycæides* and *Itylos*, have retained in the Andes (whither they brought them) structural shapes closely similar to such structures from which *Chilades*, *Lycæides* and *Aricia*, respectively, can be easily imagined to have been derived in their Old World homes. Three, namely *Pseudochrysops*, *Hemiargus* and *Echinargus* reveal certain characters of the palæotropical *Freyeria* (the first) and *Chilades*, but have become strongly differentiated in the neotropics. Still more remote is the relationship between *Cyclargus*, *Pseudothecla* and *Pseudolucia* on one side and Old World forms on the other. It is to be noted however that *Cyclargus* and *Hemiargus* are allied to *Aricia* and *Itylos* in the falx. The general *Hemiargus* - *Echinargus* - *Cyclargus* type of ædeagus is not found in the Old World and apparently represents a very ancient type retained and developed in the neotropics, but extinct or unrecognizably altered elsewhere.

One can assume, I think, that there was a certain point in time when both Americas were entirely devoid of *Plebejinæ* but were on the very eve of receiving an invasion of them from Asia where they had been already evolved. Going back still further, a modern taxonomist straddling a Wellsian time machine with the purpose of exploring the Cenozoic era in a "downward" direction would reach a point — presumably in the early Miocene — where he still might find Asiatic butterflies classifiable on modern structural grounds as *Lycænids*, but would not be able to discover among them anything definitely referable to the structural group he now diagnoses as *Plebejinæ*. On his return journey, however, he would notice at some point a confuse adumbration, then a tentative "fade-in" of familiar shapes (among other, gradually vanishing ones) and at last would find *Chilades*-like and *Aricia*-like and *Lycæides*-like structures in the Palæarctic region.

It is impossible to imagine the exact routes these forms took to reach Chile, and I have no wish to speculate on the details of their progress, beyond suggesting that throughout the evolution of *Lycænidæ* no two species ever became differentiated from each other at the same time in the same habitat (*sensu stricto*), and that the arrival of *Plebejinæ* in South America preceded the arrival in North America (and differentiation from Old World ancestors) of the genera *Icaricia* and *Plebulina* (and of the species *Plebejus sæpiolus*) while the latter event in its turn preceded the invasion of North America by holarctic species which came in the following sequence: *Lycæides argyrognomon* (subsequently split), *Agriades glandon*, *Vacciniina optilete*. It is to be noted that only those *Plebejinæ* which breed freely in the far north of Eurasia (besides enjoying an enormous distribution in other, mainly alpine regions) are common to both Eurasia and America.

In regard to certain *Lycænids* of other subfamilies, such as the holotropical *Zizula gaika* Trimen and the South African and American genus *Brephidium*, the difficulty of making them take the Bering Strait route is very great, but in the case of *Plebejinæ*, the discontinuity in distribution is not so disconcerting, and I find it easier to give a friendly little push to some of the forms and hang my distributional horseshoes on the nail of Nome rather than postulate transoceanic land-bridges in other parts of the world.

The majority of neotropical *Plebejinæ* possess a sagum or rudiments of one. It is completely absent only in *Itylos* as it is absent in all palæarctic, nearctic and palæotropical species. This structure can be loosely defined as a fultura superior in relation to the furca (fultura inferior), but its function, if any, is obscure. One is inclined to assume that at the time of the invasion of the neotropical region from the north there existed Eurasian forms with rudiments of a sagum (possibly allied at that stage to the anellus now possessed by the *Catochrysopinæ* and other subfamilies) which in the subsequent flurry of hectic central palæarctic evolution was lost (and had been already lost by the ancestors of *Itylos*) but in the comparative peace of the neotropics continued to develop owing to that peculiar evolutionary inertia which in the absence of any obstruction keeps a structure tending to its maximum along certain inheritable lines.

In all (80 to 100) Old World and nearctic species the valve is of a very constant general shape.¹ Among the 19 neotropical species known, "normal" shape occurs in 11 species. The rest show four types of variation unparalleled elsewhere. In this respect the peculiar reduction of the valve in *Parachilades*, *Pseudochrysops* and *Cyclargus* would seem to be a case of stunting rather than the retention of a very short valve from which the normal elongate structure of the subfamily was evolved ("pulled out" as it were). In regard to *H. hanno* and *ramon* one suspects that the unusual shape is due to the irregular dwarfing of a *ceraunus*-like valve which had initially attained a very full shape (suggested by some of the Central American specimens), the "keel" in *hanno* and *ramon* being probably the remnant of an ample lower margin.

The underside wing pattern of neotropical *Plebejinæ* falls into two main types: catochrysopoid and ityloid. The catochrysopoid type (*Pseudochrysops*, *Cyclargus*, *Hemiargus* and *Echinargus*) is shared in the Old World by the small Palæotropical section (*Chilades*² and less strikingly, *Freyeria*) and in result, certain *Hemiargus* and *Echinargus* forms are remark-

¹ A slightly aberrant structure occurs only in *Chilades galba* and *Albulina (auct) felcis* and this leads to a false resemblance to certain *Glaucopsychninae*.

² Which, moreover, in *Chilades cleotas* (a species ranging from the Malay to the New Hebrides, at least) evolves a likeness to *Talicauda nyseus* (*Everinae*), the behavior of which (deducible from a note in Moore) is that of a "protected" species. *Freyeria* on the other hand tends, mainly owing to its small size, to a *Brephidium* aspect.

ably similar to *Chilades* forms (especially to the *galba* group), the remarkable point being that while the palæotropical ones are sympatric with the kind of *Catochrysopinæ* which they resemble (and which is especially well represented in Africa, e.g., "*Euchrysops*"¹), the latter does not exist in the neotropics (where the sparse representatives of the *Catochrysopinæ* belong, as exemplified by the holarctic *Leptotes*, to a different phase of pattern). The Ityloid pattern group includes: *Itylos*, one of the two *Pseudolucia* species, *Paralycæides* (to a certain extent) and *Parachilades*. At its initial stage the "pseudovitta" of *Itylos* copies the differently formed vitta of certain palearctic *Plebejinæ* (cp. *Agrodiætus damon* or *Aricia donzelli*).

Taking 100 as the minimum number of known *Plebejinæ* (see footnote further on) the following figures may be given for the various regions where these insects occur. Only six species exist in the Palæotropical region proper, one reaching the Palæarctic, another reaching both the Palæarctic and S. Africa and a third extending into Australia. As many as 19 (probably more) exist in the neotropical region (12 of these are restricted to the Andes) and nowhere else, except for the fact that 2 reach the nearctic as 2 do in regard to the Caspian and E. Mediterranean region (these four invaders are not taken into account further on²). As many as 60 occur in the Central Palæarctic (between 40° and 90° longitudes). One half of these, with the addition of only half-a-dozen (most of which are poorly differentiated) not occurring elsewhere, are found in the Western Palæarctic (the whole of C., N.W. and W. Europe having 20, all of which it shares with the Mediterranean area, while 27 can be collected in a narrow area stretching from the southern Alps to the mountains of Spain); but in the Eastern Palæarctic the number dwindles to 12, all of which occur also in the Central Palearctic.

Some 30 (of which only 3 are holarctic) are found in the New World, and of these hardly a dozen exist in N. America. All these occur in its western part; only 5 reach eastern Canada and only one sparsely occurs in a large³ area between the

¹ Provisionally: *Euchrysops* Butler, *sensu mihi* = *Euchrysops* s. Bethune Baker + *Neochrysops* Bethune Baker minus the *niobe* group, for which the erection of a separate genus is necessary.

² In the eastern part of the Central Palearctic half a dozen palearctic species attain along the mountain chains technically tropical territory.

³ The paucity of true butterflies in the eastern United States is unrivalled in any other general area of the same size in the temperate part of holarctic territory.

Atlantic and the Mississippi, while 2 representatives of the neotropical group invade the more southern states.

In conclusion the following complete list of the genera of the *Plebejinæ* of the world is appended.¹

PLEBEJINÆ (s.s.)

100–120 species in 24 genera

- I *Parachilades* Nab.: t. *titicaca* Weymer; 1; Neot. in Andes.
- II *Chilades* Moore: t. *lajus* Cramer; 4–5; PT, one reaching P.
- III *Pseudochrysops* Nab.: t. *bornoi* Comstock-Huntington; 1; Neot. in W. I.
- IV *Cyclargus* Nab.: t. *ammon* Lucas; 4; Neot. in W. I. to Fla.
- V *Hemiargus* Hübner: t. *cerargus* Fabricius; 3; Neot., one reaching S. Nea.
- VI *Echinargus* Nab.: t. *isola* Reakirt; 2; Neot., one reaching SW Nea.
- VII *Pseudolucia* Nab.: t. *chilensis* Blanchard; 2; Neot. in Andes.
- VIII *Pseudothecla* Nab.: t. *faga* Dognin; 1; *id.*
- IX *Paralycæides* Nab.: t. *inconspicua* Weymer; 1; *id.*
- X *Lycæides* Hübner: t. *argyrognomon* Bergstrasser (Tutt); 6; P, Nea, P+Nea.
- XI *Freyeria* Courvoisier: t. *trochilus*; 2; PT one reaching P, the other ² reaching AU.
- XII *Plebejus* Kluk: t. *argus* Linnæus; 7–8; P, one in Nea.
- XIII *Plebulina* Nab.: t. *emigdionis* Grinnell; 1; S.W. Nea.
- XIV *Itylos* Draudt: t. *moza* Staudinger; 4; Neot. in Andes.
- XV *Aricia* R.L.: t. *agestis* [Schiff]; 6–8; P.
- XVI *Icaricia* Nab.: t. *icarioides* Boisduval; 5; W. Nea.

¹ Abbreviations: t—type of genus. P—Palearctic Region. PT—Palæotropical (excluding AU—Australia), Nea—Nearctic (excl. Florida), Neot.—Neotropical. The figure after the type refers to the number of species in the genus. When two numbers are given, the second includes additional species which I have not dissected myself, but which have been figured (genitalia) by other observers. I have not taken into account several names in Forster's (1938, *l.c.*) list which in various respects is very unreliable.

² The correct name of which is *Freyeria putli* Kollar—granted of course that *Chilades putli* Moore and *Chilades trochilus isophthalma* Waterhouse (*nec* Herich-Schaffer) which I have dissected are the same as *Lycæna putli* Kollar from North India whence I have no material.

- XVII *Polyommatus* Latreille: t. *icarus* Rottemburg; 7-9; P.
 XVIII *Vacciniina* Tutt: t. *optilete* Knoch; 4; P, one P+Nea.
 XIX *Eumedonia* Forster: t. *eumedon* Esper; 1; P.
 XX *Albulina* Tutt: t. *orbitulus* Prunner; 6-7; P.
 XXI *Agriades* Hübner: t. *glandon* Prunner; 4; P, one P+Nea.
 XXII *Cyaniris* Dalman: t. *semiargus* Rottemburg; 1,¹ P.
 XXIII *Meleageria* Stempffer: t. *meleager* Esper; 1; P.
 XXIV *Agrodiætus* Hübner (incl. *Lysandra* Hemming): t. *damon* Schiff; 25-35; P.

EXPLANATION OF PLATE 1

All figures $\times 180 \div 2$

1. *Ædeagus* of *Agrodiætus* (= *Lysandra*) *cormion* Nabokov (? hybrid between *Agrodiætus coridon* Poda and *Meleageria meleager* Esper), paratype, "Moulinet, Alpes Maritimes [S. France], 20-VII-1938 leg. V. Nabokov," Am. Mus. Nat. Hist., in dorsal view.

2. *Ædeagus* (generalised *Hemiargus* s.l. etc.) in lateral view;

3. Plain falx (*Lycæides*); 4 Humped falx (*Hemiargus* etc.);

5. Angulate falx (*Agrodiætus cormion*, same specimen as 1).

1,2. Measurements of *ædeagus* (= penis + sheathing): d. distal point (often notched) of suprazonal sheath shielding vesica ventrally (projecting from under the vesica in fig. 1 as seen from the dorsal side of the organ); lt. lateral edges of ventral part of suprazonal sheath (when fully developed these enfolding edges just reach the dorsal side of the organ and in dorsal view appear to line the vesica laterally as in *Agrodiætus* etc.); o. point at which the suprazonal sheath opens on the dorsal side (this point coincides with the zone in several genera, e.g. *Agrodiætus*); c. Chapman's process: a not unfrequently occurring spine-like or filament-like prolongation (of the dorsal lining of the sheath) running along the vesica. v. vesica (exposed distal portion of penis proper) studded with cornuti (minute hook-like or spine-like structures not represented in a number of genera); e. everted frothy membrane of vesica in erection; z. zone (level at which the organ is attached to the genital cavity); aa. alulæ (out-turned flaps of subzonal sheath); p. base of penis enclosed in subzonal sheath; tl. proximal tabs of subzonal sheath.

dt. length of *ædeagus*; dz. length of suprazonal sheath ventrally; oz. length of suprazonal sheath dorsally (excluding Chapman's process); do. length of vesical opening on the dorsal side; zt. length of subzonal sheath with breadth measured at w in lateral view; vp. length of penis proper.

3,4,5. Right uncus lobe with falx in flat ventral view; FHBUSA- falx, LUB-uncus lobe.

F- point of forearm; H- point of elbow; B- basal point of humerulus; U- posterior point of shoulder proper; S- summit of shoulder; u- anterior point of shoulder; A- apex of (proximally directed) falcate arch; L- distal point of uncus lobe.

¹ *persephatta* Alpheraky which Stempffer (followed by Forster) makes congeneric with *semiargus* (apparently on the strength of a casual note in Chapman) belongs to another subfamily (*Glaucopsychninae*).

FH— vertical extension of forearm with its horizontal extension measured at level f; Ah— vertical extension of humerulus, and HB— horizontal extension; Sb— vertical extension of shoulder proper with its horizontal extension measured at level s; LB— vertical extension of uncus lobe with its horizontal extension measured at l. (For valve see expl. of pl. 6, fig. MOZ 3)

In *Lycæides* the triangle FHU (with HU giving the oblique length of the humerulus and with FU equal to LU) provides characters for separating the species, while in *Agrodæatus* and some other genera the length of the elbow (AH) is of taxonomic importance.

I take the opportunity to figure the genitalia (1,5) of the curious butterfly described by me much too briefly in 1941 (J. New York Ent. Soc. 49: 265-267). Both in ædeagus and in falx it seems to be intermediate between *A. coridon* Poda and *M. meleager* Esper.

EXPLANATION OF PLATE 2

TIT — *Parachilades titicaca* Weymer (f. "*speciosa*"), prep. 488, "Sicasica, Bolivia, 1-X-1899" ex coll. Weeks, Mus. Comp. Zool.

CLE — *Chilades cleotas kaiphas* Fruhstorfer, prep. 585, "Morobe Dist., New Guinea, 19-II-1932, leg. H. Stevens" Mus. Comp. Zool.

PAN — *Chilades pandava* Horsfield [*vide* Moore] (Swinhoe 1910 [*Edales*], Chapman 1916), prep. 548, "Kandy [Ceylon]" ex coll. Weeks, Mus. Comp. Zool.

CON — *Chilades galba contracta* Butler (*Chilades cnejus* Chapman, nec Fabricius), prep. 596, "Karachi [N.W. India]" ex coll. Weeks, Mus. Comp. Zool.

FAG — *Pseudothecla faga* Dognin, prep. 611, "Peru," ex coll. Huntington, Am. Mus. Nat. Hist.

BOR — *Pseudochrysops bornoi* Comstock-Huntington, paratype, prep. 496, "Pont-Beudet, Haiti, about 100 ft. alt., 3-4-III-1922," ex coll. Am. Mus. Nat. Hist., Mus. Comp. Zool.

1 — Ædeagus, lateral view. 1a — tip of same in ventral view.

2 — furca (BOR with membranous lining).

3 — uncus lobe, falx and part of tegumen, ventral view.

4 — valve.

5 — rostellum.

All figures $\times 90 \div 2$

EXPLANATION OF PLATE 3

DOM (1-4) — *Cyclargus dominica* Moschler, prep. 501, "Baron Hill, Jackson Town (Jamaica), 1200 ft. alt., III, leg. L. Perkins," Mus. Comp. Zool.

AMN — *Cyclargus ammon* Lucas

AMN 1 — prep. 507 "Sierra Maestra, E. Cuba, 1,000 ft. alt., 16-VI-1930, leg. Clorinda Querci," ex coll. Weeks, Mus. Comp. Zool.

AMN 1a, 2,3,4 — prep. 375 "*id.* 23-VII-1930, *id.*" *id.*

WOO — *Cyclargus woodruffi* Comstock-Huntington, prep. 537, "Tortola, Virgin Islands, 2-IV-1925 ex coll. Amer. Mus. Nat. Hist., Mus. Comp. Zool.

TH. (TH., NO., BE.) — *Cyclargus thomasi* Clench

TH.TH1 — *thomasi thomasi* Clench, prep. 565, "Great Inagus, Bahamas, II-1934, Armour Exp.," Mus. Comp. Zool.

- TH.TH 4 — *id.*, prep. 516, *id.*
 TH.TH. 1b, 2,3 — *id.*, holotype, prep. 520, "Arthur Town, Cat Isl., Bahamas, 16-VII-1935, leg. W. J. Clench," Mus. Comp. Zool.
 TH.NO 3 — *thomasi noeli* Comstock-Huntington, paratype, prep. 502, "Haiti, leg. P. R. Uhler," Mus. Comp. Zool.
 TH.BE 1a — *thomasi bethune-bakeri* Comstock-Huntington, prep. 581, "Miami, Florida, 8-15-IX," ex coll. Weeks, Mus. Comp. Zool.
 TH.BE 3 — *id.*, prep. 519, "Ft. Lauderdale, Florida, 23-VI-1933, leg. M. Bates," Mus. Comp. Zool.
 1, a, b — ædeagus, with sagum and furca (except AMN 1a)
 1 — lateral view
 1 a — ventral
 1 b — dorsal
 2 — uncus lobe and falx, ventral view.
 3 — valve
 4 — comb of valve, $\times 360 \div 2$

All figures, except when otherwise stated, $\times 90 \div 2$

EXPLANATION OF PLATE 4

- HA (with abbreviations of localities) — *Hemiargus hanno* Stoll
 HA. Sur. — *H. hanno hanno* Stoll, neotype, prep. 601, "Paramaribo, Surinam, 18-IV-1927," ex coll. Cornell Univ., Amer. Mus. Nat. Hist.
 HA. Bra. — *H. hanno hanno prox.*, prep. 577, "Sao Paulo, Brazil, V, leg. Bruno Pohl," Mus. Comp. Zool.
 HA. Ven. — *H. hanno ssp.*, prep. 537*, "Suapure, Venezuela, 27-VI-1899," ex coll. Weeks, Mus. Comp. Zool.
 HA. Bol. — *H. hanno ssp.*, prep. 517, "Chulumani, Bolivia, 28-XI-1898, ex coll. Weeks, Mus. Comp. Zool.
 HA. Col. — *H. hanno bogotana* Draudt, prep. 602, "Cota, n. Bogota, Colombia, 2,600 m. alt., 28-VIII, 1938, leg. T. Hallinan," ex coll. Am. Mus. Nat. Hist., Mus. Comp. Zool.
 HA. Pan. — *H. hanno ssp.*, prep. 600 "El Volcan Chiriqui, Panama, 3-III-1936, leg. F. E. Lutz," ex coll. Am. Mus. Nat. Hist., Mus. Comp. Zool.
 HA. Bar. — *H. hanno ssp.*, prep. 511, "Barro Colorado, Panama, 2-II, leg. M. Bates," Mus. Comp. Zool.
 HA. Mar. — *H. hanno ssp.*, prep. 568, "Martinique" Mus. Comp. Zool.
 HA. P.R. — *H. hanno watsoni* Comstock-Huntington, paratype, prep. 569, "San Juan, Puerto Rico, 11-14-II-1914," Mus. Comp. Zool.
 HA. His. — *H. hanno ssp.*, prep. 498, "La Vista and vic., La Selle Range, Haiti, 5-7,000 ft. alt., 16-23-IX-1934, leg. M. Bates," Mus. Comp. Zool.
 RAM — *Hemiargus ramon* Dognin, prep. 616, "San Rafael, Ecuador, leg. E. W. Rorer, VII-1919," Mus. Comp. Zool.
 CE (with abbreviations of localities) — *Hemiargus ceraunus* Fabricius
 CE. CE. — *H. ceraunus ceraunus* Fabricius, prep. 570, "Kingston, Jamaica, 6-XII-1871," ex coll. Scudder, Mus. Comp. Zool.
 CE. His. — *H. ceraunus ssp.*, prep. 499, "Ennery, Haiti, n. 1,000 ft. alt., 16-VIII-1934, leg. M. Bates," Mus. Comp. Zool.

- CE. Nav. — *H. ceraunus* ssp., prep. 566, "Navassa Is., West Indies, XII-1929, leg. W. J. Clench," Mus. Comp. Zool.
- CE. Cub. — *H. ceraunus filenus* Poey, prep. 515, "Sierra Maestra, E. Cuba, 1,000 ft. alt., 10-XI-1929, leg. O. Querci," ex coll. Weeks, Mus. Comp. Zool.
- CE. Bah. — *H. ceraunus* ssp., prep. 564, "Clarencetown, Long Is., Bahamas, II-1934, leg. Armour Exp.," Mus. Comp. Zool.
- CE. Fla. — *H. ceraunus antibubastus* Hübner, prep. 525, "Egmont, Florida, 23-IV-1904," ex coll. Fall, Mus. Comp. Zool.
- CE. Mass. — *H. ceraunus antibubastus* Hübner, prep. 579, "So. Abington, Massachusetts, V-1880, leg. J. E. Bates," ex coll. Weeks, Mus. Comp. Zool.
- CE. Ari. — *H. ceraunus gyas* Edwards, prep. 523, "Baboquavaria Mts., Pima Co., Arizona, 15-30-VII-1903, leg. O. C. Poling," ex coll. Weeks, Mus. Comp. Zool.
- CE. Cal. — *H. ceraunus gyas* Edwards *prox.*, prep. 524, "San Diego, California, 14-VIII-1908, leg. Geo. H. Field," ex coll. H. C. Fall, Mus. Comp. Zool.
- CE. Mex. — *H. ceraunus zachæina* Butler *prox.*, prep. 613 and 509, "Apatzingan, Michoacan, Mexico, 1,200 ft. alt., moist jungle La Majada, at mud, 8-VIII-1941, leg. R. Haag," Mus. Comp. Zool.
- CE. C.R. — *H. ceraunus zachæina* Butler, prep. 513, "Punto Araras, Costa Rica, 11-XI-1871," ex coll. Scudder, Mus. Comp. Zool.
- CE. Col. — *H. ceraunus* ssp., prep. 575, "Colombia," ex coll. Paine, Mus. Comp. Zool.
- 1 — ædeagus with furca and rudimentary sagum, lateral view,
 a — distal portion, ventral view
 b — id., dorsal view
- 2 — uncus lobe, falx and part of tegumen
- 3 — valve

All figures $\times 90 \div 2$

EXPLANATION OF PLATE 5

- N.SP — *Echinargus* sp. prep. 578, "Port of Spain, Trinidad, XII-1912-V-1913, leg. R. Thaxter," Mus. Comp. Zool.
- ISO — *Echinargus isola* Reakirt
- ISO 1,2 — prep. 540, "Tancitaro, Michoacan, Mexico, 6,000 ft. alt., on *feces*, 10-VII-1941, leg. R. Haag," Mus. Comp. Zool.
- ISO 1a, 3 — prep. 478, "Round Mt., Texas, IX-1930, ex coll. Fall," Mus. Comp. Zool.
- CHI — *Pseudolucia chilensis* Blanchard
- CHI 1, a,b — prep. 619, "Central Chile, 1882-1885, leg. H. B. James," ex coll. Weeks, Mus. Comp. Zool.
- CHI 2,3,4 — prep. 534, "Penco, Chile," ex coll. Weeks, Mus. Comp. Zool.
- COL — *Pseudolucia collina* Blanchard, prep. 536, "Penco, Chile," ex coll. Weeks, Mus. Comp. Zool.
- 1,a, b, ædeagus with sagum and furca (ISO 1a, sagum separate)
- 1 — lateral view, 1 a, ventral view, 1 c, dorsal view
- 2 — uncus lobe, falx and part of tegumen
- 3 — valve
- 4 — comb of valve $\times 360 \div 2$

All figures, except when otherwise stated, $\times 90 \div 2$

EXPLANATION OF PLATE 6

- INC — *Paralycaëides inconspicua* Draudt, prep. 607, "Cuzco, Peru, 3,500 m. alt., leg. Fassl," ex coll. W. P. Comstock, Am. Mus. Nat. Hist.
- KOA — *Itylos koa* Druce, prep. 592, "Puno, Peru, 12,500 ft. alt., 1-XI-1898," ex coll. Weeks, Mus. Comp. Zool.
- PAC — *Itylos pacis* Draudt, prep. 609, "Cuzco, Peru, 3,500 m. alt., leg. Fassl" ex coll. W. P. Comstock, Am. Mus. Nat. Hist.
- RUB — *Itylos ruberrotnei* Weeks
- RUB 1,a,2,3 — holotype, prep. 527, "Sicasica, Bolivia, 1-X-1899" ex coll. Weeks, Mus. Comp. Zool.
- RUB 4 — paratype, prep. 486, "Alezum, Bolivia, 8-VIII-1899" ex coll. Weeks, Mus. Comp. Zool.
- MOZ — *Itylos moza* Staudinger, prep. 606, "Bolivia," ex coll. Huntington, Am. Mus. Comp. Zool.
- 1 — ædeagus with furca, lateral view (except RUB 1 where the furca is not shown and KOA 1 where it is in ventral view as also in RUB 1a)
a — ædeagus, ventral view
- 2 — Uncus lobe, falx and part of tegumen (note VAP 2 to which the method of measurement used for *Lycæides* has been applied)
- 3 — Valve: sp — superior process; r — rostellum (free end of superior process); c — comb (serrated distal margin of rostellum); ip — inferior process; m — mentum (jutting end of inferior process); b — bullula (membranous swelling between mentum and rostellum); bs — base. The length of the valve is measured from m to bs; its breadth at the broadest part (at the "hump" or Bayard's angulation).
- 4 — comb of valve $\times 360 \div 2$:

All other figures $\times 90 \div 2$

EXPLANATION OF PLATE 7

Female armature

- TIT — *Parachilades titicaca* Weymer, prep. 590, "Sicasica, Bolivia, 1-X-1899," ex coll. Weeks, Mus. Comp. Zool.
- BOR — *Pseudochrysops bornoi* Comstock-Huntington, paratype prep. 605, "Pont Beudet, Haiti, about 100 ft. alt., 3-4-III-1922," ex coll. Am. Mus. Nat. Hist., Mus. Comp. Zool.
- AMN — *Cyclargus ammon* Lucas, prep. 530, "Sierra Maestra, E. Cuba, 1,000 ft. alt., 3-XI-1929, leg. O. Querci," ex coll. Weeks, Mus. Comp. Zool.
- HAN — *Hemiargus hanno hanno* Stoll prox., prep. 532, "São Paulo, Brazil, V, leg. Bruno Pohl," Mus. Comp. Zool.
- CER — *H. ceraunus antibubastus* Hübner, prep. 582, "Ft. Lauderdale, Florida, 10-VII-1933, leg. M. Bates," Mus. Comp. Zool.
- N. SP — *Echinargus* sp., prep. 597 "Port of Spain, Trinidad, XII-1912-V-1913, leg. R. Thaxter," Mus. Comp. Zool.
- ISO — *Echinargus isola* Reakirt, prep. 587, "Dallas, Texas, leg. Boll," Mus. Comp. Zool.
- CHI — *Pseudolucia chilensis* Blanchard, prep. 533, "Penco, Chile," ex coll. Weeks, Mus. Comp. Zool.
- COL — *Pseudolucia collina* Philippi, prep. 591, "Penco, Chile," ex coll. Weeks, Mus. Comp. Zool.

MOZ — *Itylos moza* Staudinger, prep. 528 (*Lycæna babhræ* Weeks, holotype)
"Sicasica, Bolivia 1-X-1899," ex coll. Weeks, Mus. Comp. Zool.

KOA — *Itylos koa* Druce, prep. 593, "Puno, Peru, 12,500 ft. alt., 1-XI-1898," ex
coll. Weeks, Mus. Comp. Zool.

1 — papillæ anales (Kusnezov 1912) (note pathological swelling of rod of left
papilla in N. SP. 1a)

2 — fibula, with or without portion of henia, dorsal view

3 — same, lateral view

4 — henia (Chapman 1916), completely exerted in COL 4 and ISO 4, lateral view.

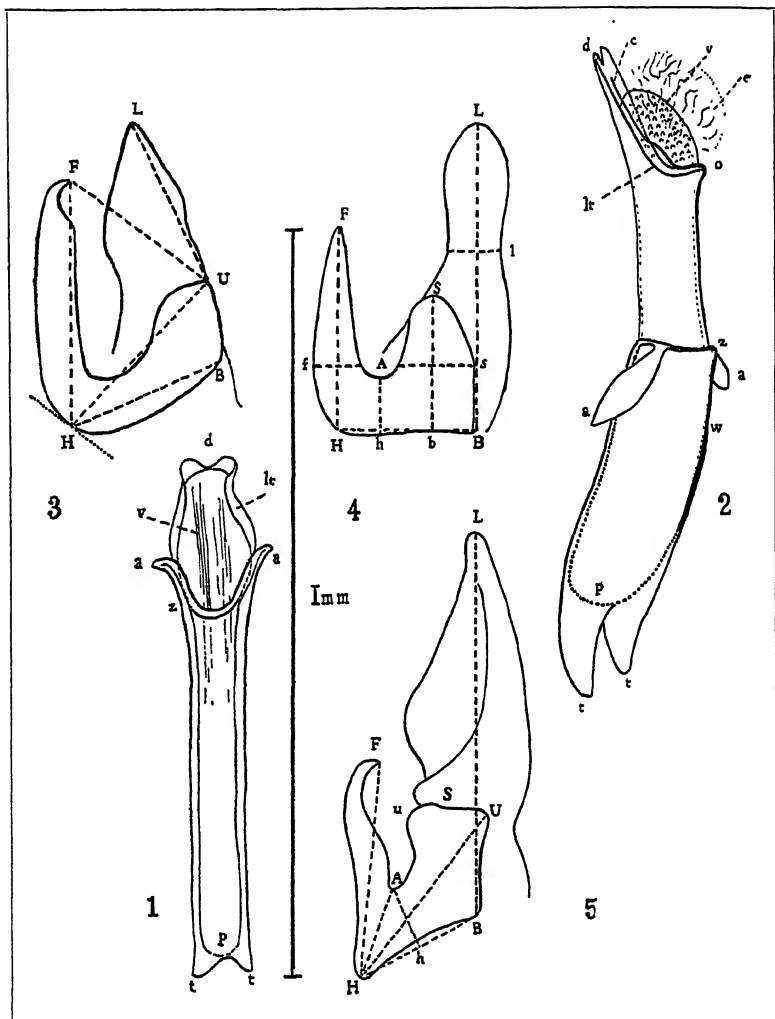
All figures $\times 90 \div 2$

EXPLANATION OF PLATE 8

Echinargus, n. sp., "Port of Spain, Trinidad, XII-1912-V-1913, leg. R. Thaxter,"
Mus. Comp. Zool. Left Hindwing underside, $\times 6.5$.

PSYCHE, 1945

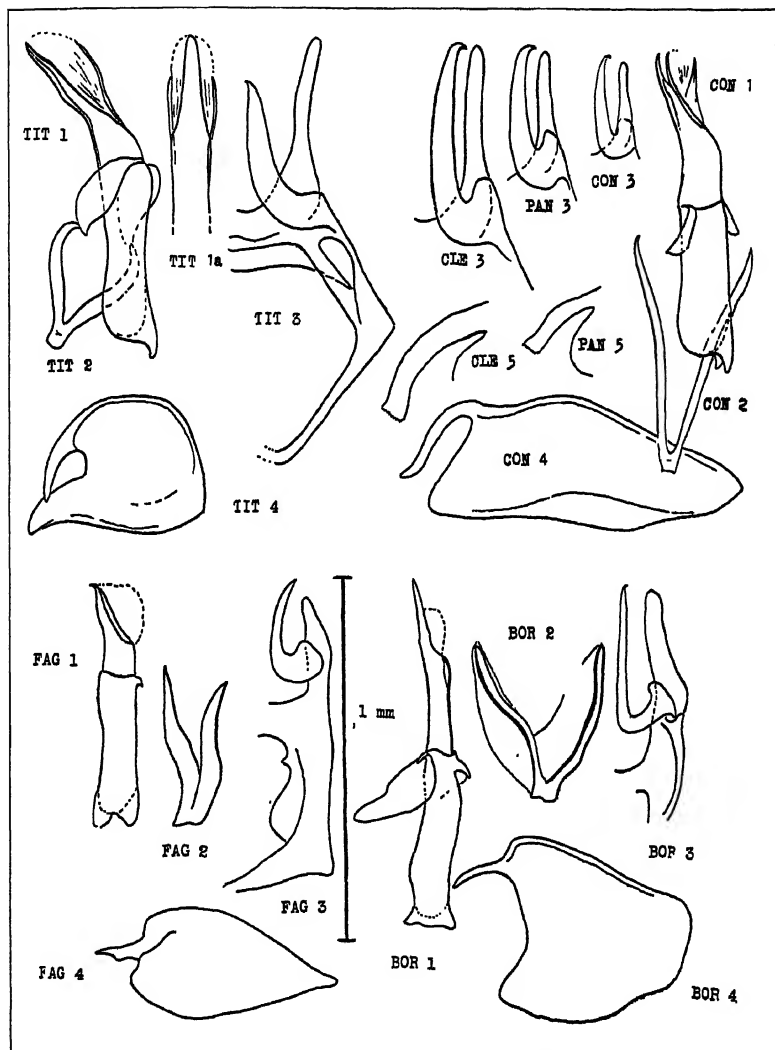
VOL. 52, PLATE 1

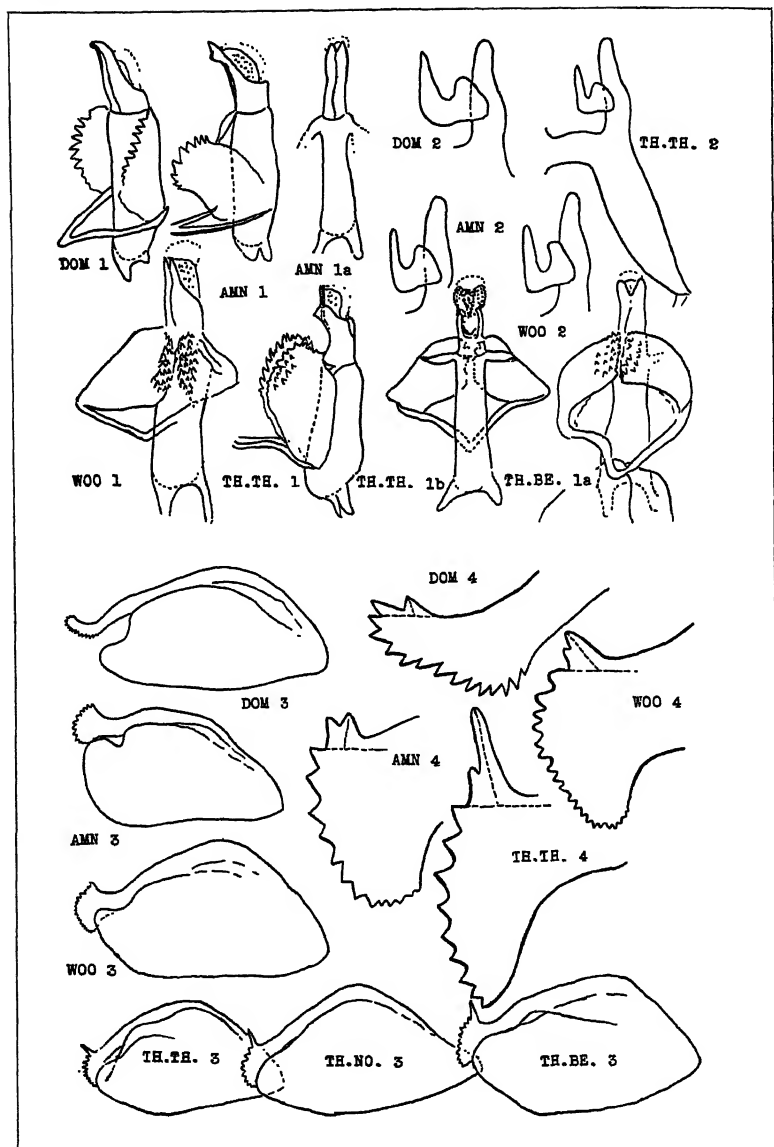


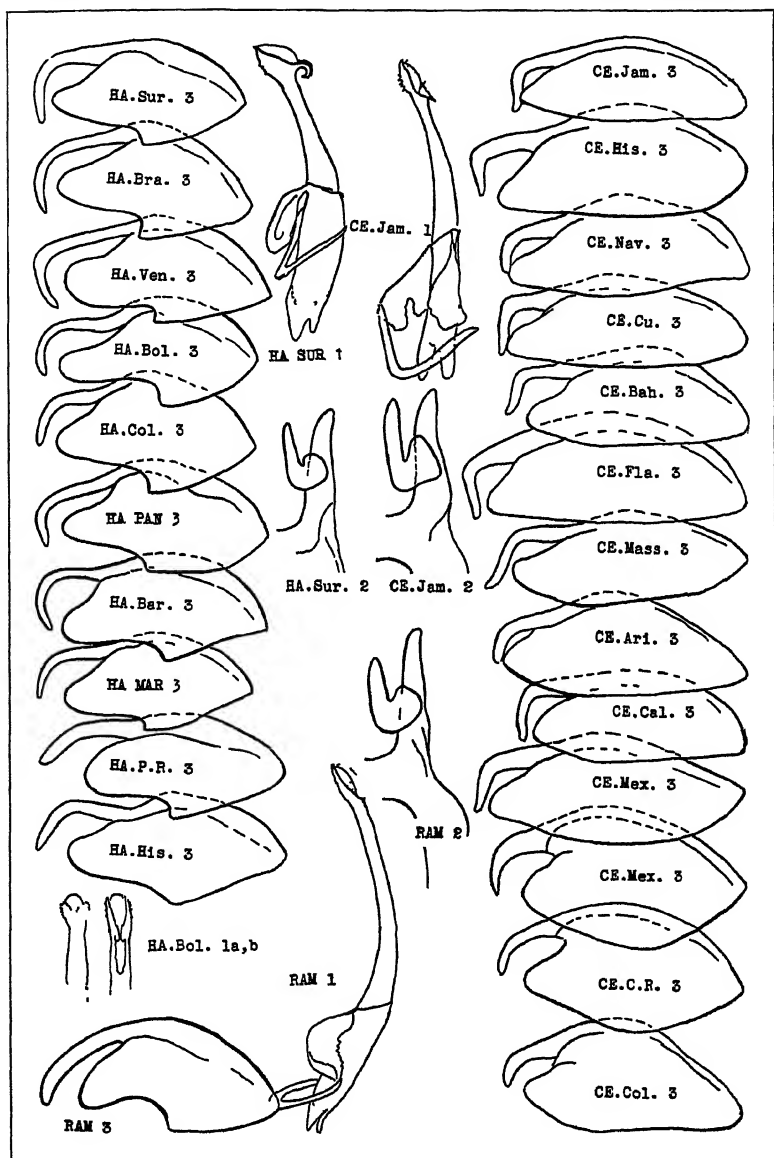
NABOKOV — NEOTROPICAL PLEBEJINÆ

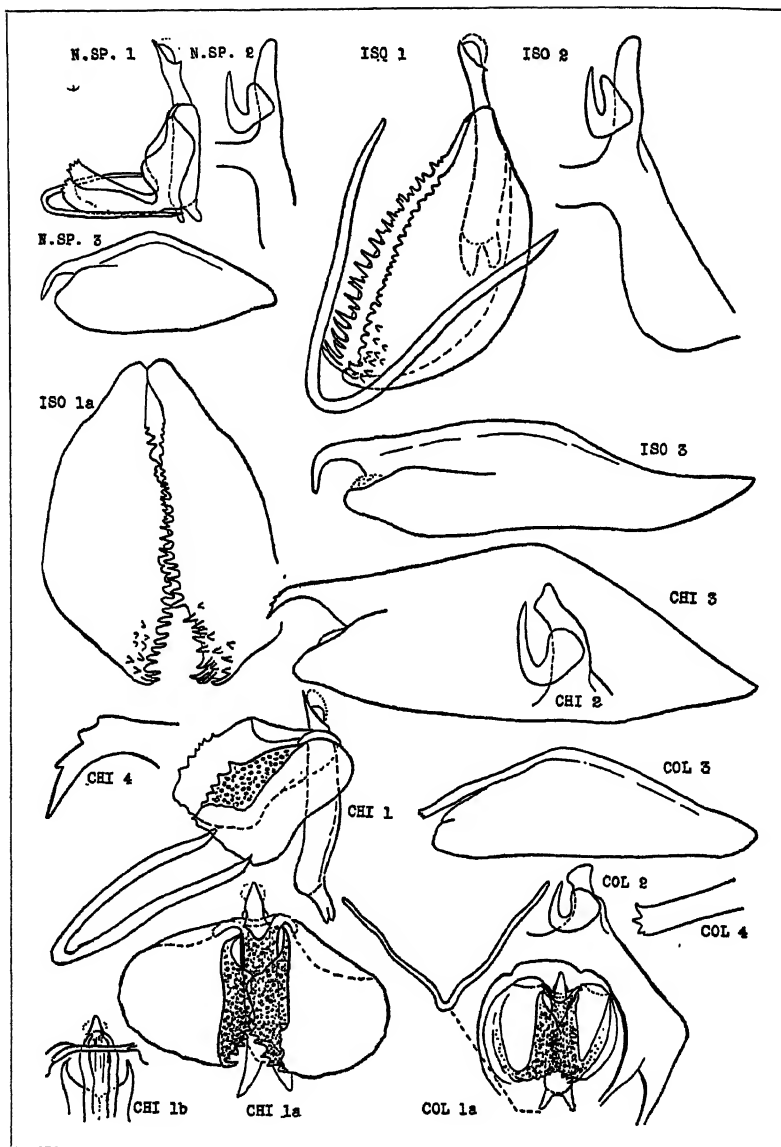
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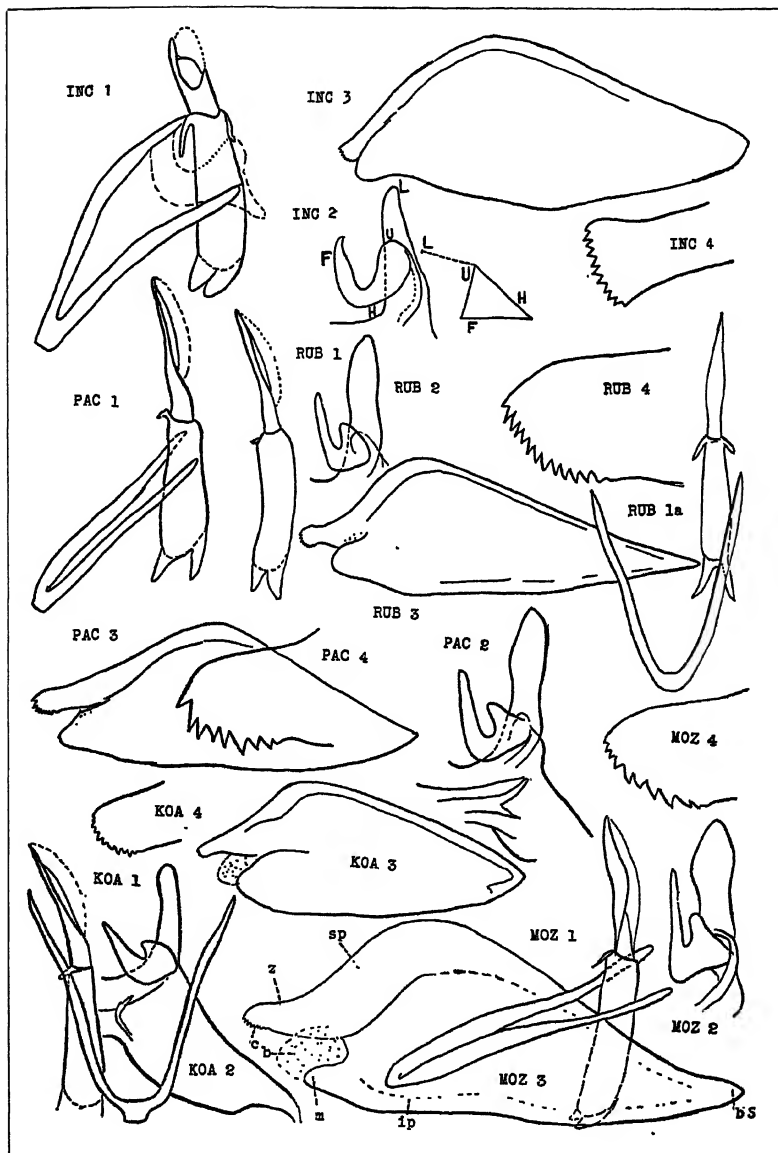
VOL. 52, PLATE 2

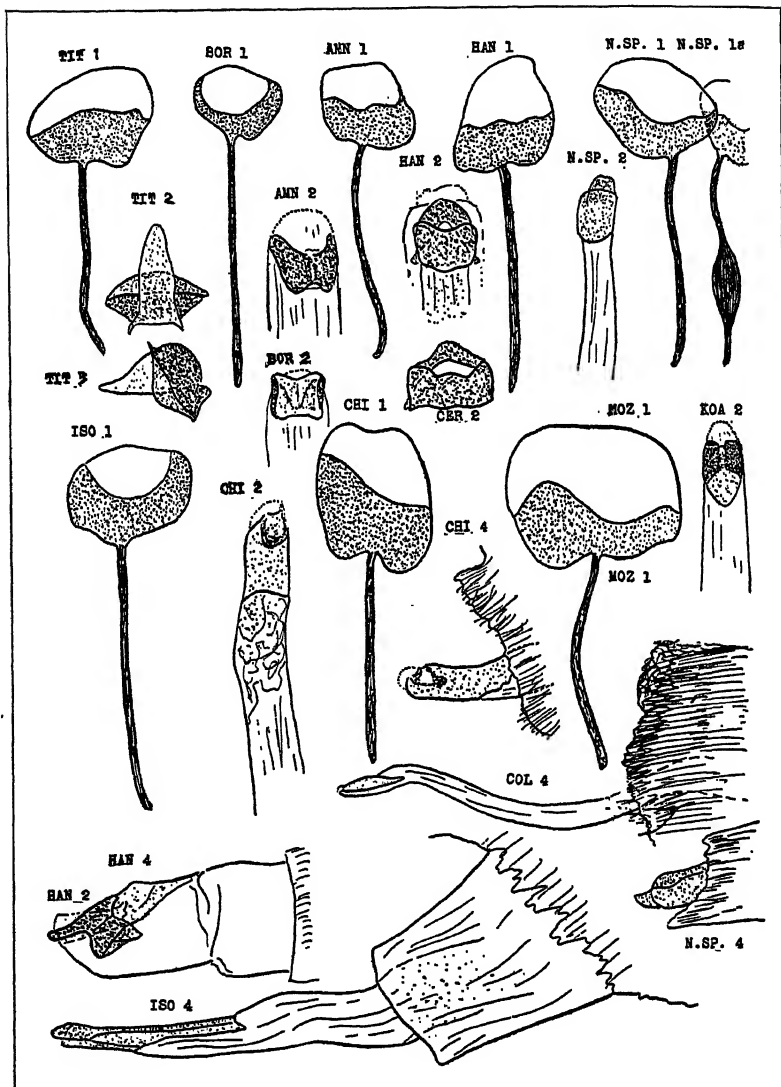


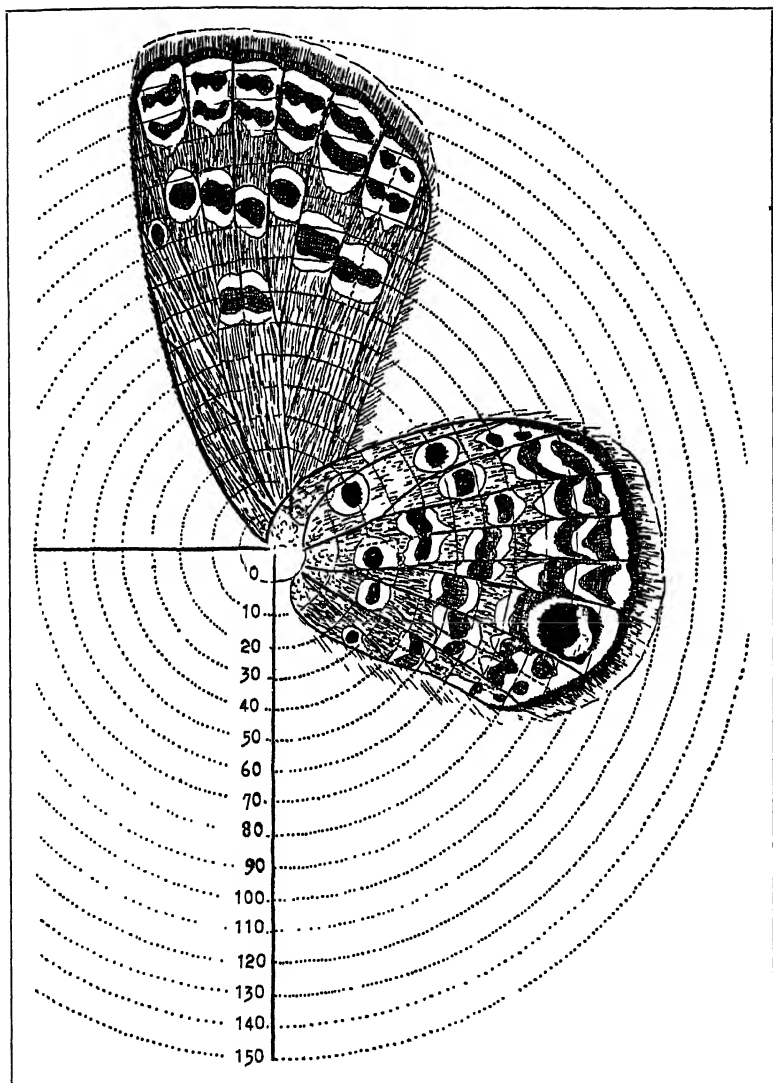












NABOKOV — NEOTROPICAL PLEBEJINÆ

TWO NEW FORMS OF *MONOMORIUM* (FORMICIDÆ)

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In the Nearctic fauna we have one very widely distributed species of *Monomorium* (*M. minimum* (Buckley)), and several other species of more local occurrence, and while *minimum* is a quite variable ant, it seems not unlikely that some of the variations may be distinct populations that warrant recognition. Examples of such are present in my collection, and are here described with the conviction that they are valid, although subsequent information might make it necessary to alter this conclusion.

Monomorium peninsulatum sp. nov.

Plate 9.

Worker. — Length 1.8–2.0 mm.

Head almost rectangular, convergence anteriorly nearly imperceptible; occipital angles abrupt but rounded, posterior margin straight; clypeus produced in front and furnished with two carinæ which project as distinct, sharply pointed teeth beyond the border; posterior clypeal margin extending deeply between the frontal carinæ, which are short and do not continue far behind the antennal insertions. Antennæ 12-segmented, the last three segments forming a distinct club; scape failing to reach the posterior angle of the head by a distance equal to $1\frac{1}{2}$ times its width at the apex; mandibles evenly curved, 4-toothed; maxillary palpi 1-segmented; labial palpi 2-segmented. Eye separated from mandibular fossa by a distance equal to $1\frac{1}{4}$ times its diameter.

Thorax at the rounded humeral angles $\frac{2}{3}$ as wide as the head; long and narrow, in profile moderately and evenly arched; mesoëpinotal impression distinct and fairly deep. Epinotum with rounded angle, so that the basal and declivous faces pass gradually into each other; epinotal spines absent. Petiolar surface rounded, the sides subparallel and the superior border

entire; anterior face flat, posterior face convex; peduncle short but evident and without ventral spine. Postpetiole globose and approximately equal to petiole in width, slightly lower in height. Gaster pyriform.

Sculpture: Entire body glabrous, except the mesoëpinotal impression and mesonotal and epinotal pleuræ which have very fine rugulations, and the mandibles which are finely striate.

Pilosity: Long, fairly numerous hairs on dorsum of head (including clypeus), thorax, petiole, postpetiole, coxæ, trochanters, femora, prosternum, gula, and venter of gaster. Pubescence conspicuous on antennæ and legs, extremely dilute on gaster, apparently absent on the head and thorax, and merging into hairs on the scapes.

Color: Deep, metallic, bluish black like the queen but not as pronounced as in that caste; mandibles and tarsi yellow; antennæ, coxæ, femora and tibiæ brownish.

Female. — Length 4.5–5.0 mm.

Head, excluding mandibles, slightly wider than long, with rounded occipital angles, and decidedly convergent anteriorly; posterior border straight. Clypeus broadly rounded with two widely separated, longitudinal carinæ which project anteriorly as rather short, blunt teeth, the border of the clypeus between them appearing as a wide, shallow emargination. Frontal carinæ short, extending posteriorly and parallel until near their termination opposite the anterior edge of the eyes, where they diverge in evenly rounded curves. Eyes moderate and oval in outline, placed mid-way between the mandibular fossæ and the posterior angles of the head. Ocelli prominent. Antennæ 12-segmented, the last four segments forming an indistinct club; scape evenly curved at the base. Mandibles 4-toothed, the basal tooth blunt, and the rest increasing in length to the rather long, sharp, apical tooth. Maxillary palpi 2-segmented. Labial palpi 2-segmented.

Thorax from above as wide as the head and evenly tapered from end to end; in profile the mesonotum is moderately elevated and curved dorsally; scutellum divided into two lateral triangles which are separated by the forward extension of the postscutellum to meet the scutum; parapsidal furrows distinct but shallow; metanotum in the form of the usual transverse band. Epinotum in profile is evenly rounded and descends abruptly from the metanotum, there being no angular separa-

tion of basal and declivious faces. Petiole with a well-marked peduncle bearing a long, low, mid-ventral keel terminating in a small tooth; anterior surface of node rather steep and flat, posterior surface convex; summit of node truncated and with a broad, shallow emargination across its whole width, the lateral angles rounded. Postpetiole globose, and $\frac{1}{3}$ wider than the petiole, its dorsal border flat and entire. Abdomen egg-shaped as usual in ant queens. Legs slender. Wings hyaline and with veins much reduced; costal, median and radial cells present, one closed discoidal cell weakly indicated.

Sculpture: Front and sides of head with fine, longitudinal rugæ, and clypeus longitudinally striated except in the median area; vertex and gula non-striated; all surfaces of the head except the front and clypeus pitted with abundant, deep punctures; mandibles striato-punctate. Thorax, including the epinotum, with numerous though more scattered punctures, and its surface very shining; a few striations appear on the post-scutellum and on the pleuræ just below the wing insertions; metanotum with rather coarse, transverse rugæ, and the epinotum has coarse, parallel rugæ on all surfaces, trending antero-posteriorly on the sides and transversely across the base and the declivity. Petiole and postpetiole, except the dorsal surfaces, with distinct rugulations. Abdomen smooth and shining, but having deep, piligerous punctures.

Pilosity: Head, thorax, petiole, postpetiole, and abdomen covered with abundant, long, light yellow, flexuous hairs, except the mid-dorsal areas from anterior to posterior in each of these regions; legs, scapes, and antennal funiculi equally pilose. Pubescence on all parts absent or at most extremely dilute.

Color: Yellowish brown to brown on the head, thorax, legs, scapes, funiculi, and sides of petiole and postpetiole; mandibles, tibiae, and tarsi lighter; postero-dorsal portion of head, the mesonotum, petiole, and postpetiole darker and in some specimens almost black; entire gaster, except the posterior tip, of a deep, bluish black, metallic luster.

Type locality: South Miami, Florida.

Cotypes: in the author's collection (1 queen and 1 worker).

Paratypes: in the author's collection and in the U. S. National Museum.

Described from 64 females (only one of which retained a fore and a hind wing), and numerous workers collected by my wife,

Ella Virginia Gregg, in a pine-palmetto woodland. The nest was indicated by a crater in a rather sandy patch of soil. Upon excavation to obtain the colony, a great deal of porous limestone was encountered, and many of the ants were distributed through the interstices of the rock. My wife's attention was attracted by the ever increasing number of deälated females which issued from the crevices, but her efforts to continue digging met with much difficulty. Although over 60 queens were secured, we are certain many more were beyond our reach. A heavy shower put an end to operations and we were unable to return to the site to ascertain the extent of the colony. *Monomorium* is known at times to have many queens, and occasions such as this case probably indicate the adoption of recently deälated females either of the same or adjacent nests.

The worker of *peninsulatum* differs from that of *minimum* in the following respects: the petiolar node is noticeably larger and higher, and its anterior face is more vertical so that the peduncle appears more distinct; the mesopleuræ and sides of the epinotum have delicate rugulations unlike those parts in *minimum* which are smooth and shining; the coloration is a deeper black, with bluish, metallic reflections in certain lights, and the clypeal teeth are slightly further apart.

The *peninsulatum* female may be distinguished by the fact that it is of larger size (*minimum* being about 4 mm.), the ocelli are much larger and more prominent, the clypeal teeth are blunter and a little more widely separated, and the whole body appears quite shining though the sculpturing is more pronounced. Punctures are deep and numerous on the head and thorax, and obvious, coarse rugæ cover the entire epinotum (present on *minimum* only at the extreme ventral aspect of the declivity). Petiole and postpetiole are more quadrate and angular, and the superior face of the former is depressed into a wide, shallow notch. Peduncle is more pronounced and has a ventral ridge and tooth which are almost absent in *minimum*. Hairs are coarser and more abundant. Color of much of the head and thorax is yellowish or reddish brown, and the gaster is of a dark, bluish black that is more noticeable than in the worker, the entire ant contrasting strongly with the queen of *minimum* which has a uniformly brownish black body.

Notwithstanding the fact that the worker of this species and that of *M. minimum* are very similar, they still can be separated

by certain constant characters as indicated above. The queens, moreover, show decided differences, and it is felt the specimens represent a new form which deserves specific rank. While *minimum* is widely distributed from east to west, there seems to be little cause for questioning the distinctness of the form I have called *peninsulatum* after the portion of the country from which it was obtained. In all probability it will be found on some of the adjacent islands; it may even be a West Indian ant which has entered continental United States at its most southern extremity. If this remains an undoubted species, the known formicid fauna of Florida will have increased to 118 ants. Dr. M. R. Smith (1944), in an addition to the list of ants of that state, brought the total from 107 to 117 species.

The new ant appears to be very similar to one described by W. L. Brown as *Monomorium viridum* from New Jersey. Judging from the description of this species, the female *M. peninsulatum* may be said to differ from that of *viridum* in the following respects. There are no transverse striæ in the ocellar triangle nor behind it, the anterior faces of the petiole and postpetiole are sculptured and not smooth, the clypeal teeth are quite short and blunt, the head and thorax have slight or no indication of metallic blue, and the color of the abdomen is metallic blue, not green. The size is a little smaller than *viridum*, the female measuring 4.5 to 5.0 mm. instead of 5.3 to 5.7 mm., and the worker being 1.8 to 2.0 mm. instead of 1.8 to 2.8 mm.

Monomorium minimum subsp. *emersoni* subsp. nov.

Worker. — Length 1.6–1.8 mm.

Practically indistinguishable from the same caste of *M. minimum* (typical) except that it is perhaps a shade lighter in color.

Female. — Length 4.3 mm.

Differs from the queen of *minimum* in the much more slender construction of the head and thorax, being much narrower than in the typical form; abdomen, however, of the same width. The petiole and postpetiole are both slightly wider than in *minimum*, and the petiolar node is more rounded and with a more concave anterior face which causes the peduncle to contrast with the node; sides finely rugose. The thorax bears wings, as shown by their stumps, but none were present on the specimens examined.

The epinotum is transversely striated over its complete upper and lateral surfaces, contrary to that of the type; the angle between the base and the declivity is more pronounced, and the whole structure is longer and higher. Slight tubercles are present in the positions usual for epinotal spines. Surface somewhat less shining than in *minimum*, especially the head which is almost opaque. Hairs slender and abundant on all parts, but longer on the gaster. Color dark brown instead of black; antennæ and legs lighter, with tibiæ and tarsi yellowish.

Described from one queen and numerous workers taken by Dr. A. E. Emerson in April, 1937 at Globe, Arizona, and the writer derives pleasure in naming this ant after his former teacher. The nest was under a stone at an elevation of 6,300 feet. Two additional colonies of the species, each with a dea-lated female, were collected by Dr. Emerson, the one at Austin and the other at San Marcos, Texas, and these seem to be identical with the types from Arizona.

Cotypes: in the author's collection (1 queen and 79 workers).

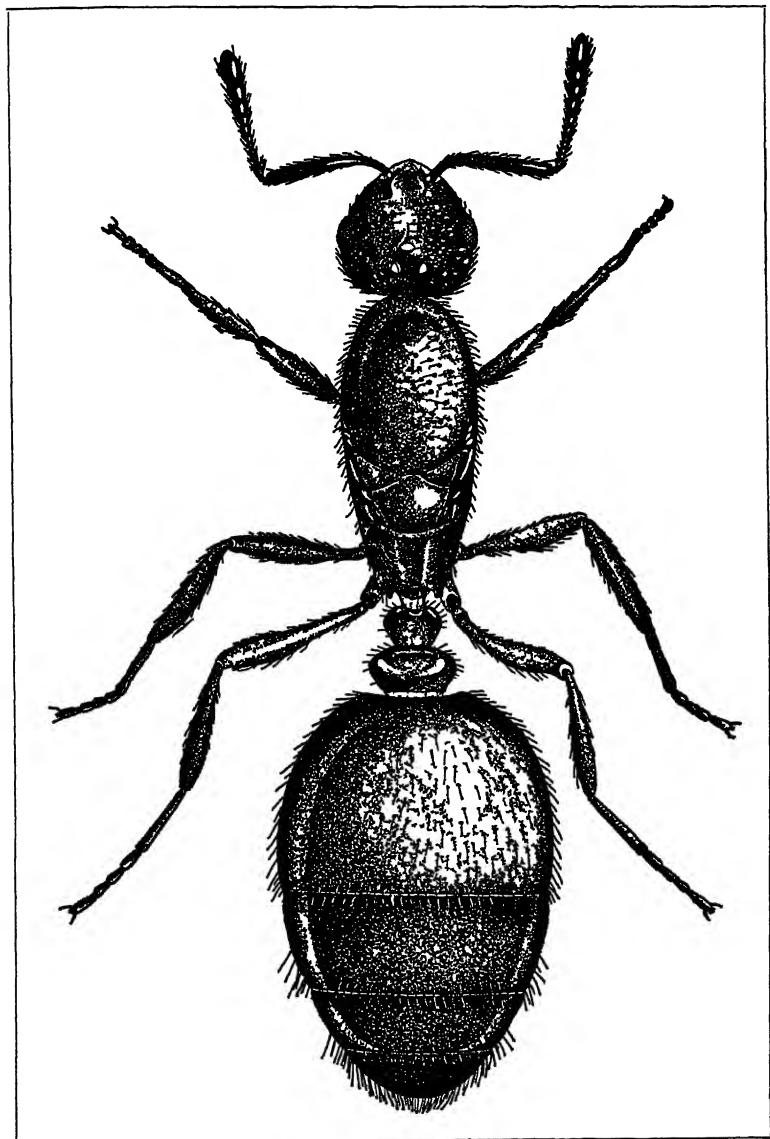
Paratypes: in the author's collection and the U. S. National Museum.

Both *Monomorium minimum* subsp. *emersoni* and *M. peninsulatum* can be distinguished readily from *M. minimum* subsp. *ergatogyna* Wheeler from Santa Catalina Island, California, and the subspecies *cyaneum* and *compressum* Wheeler from Hidalgo, Mexico, as well as the European *M. minutum* Mayr, by the fact that the females are winged while those of the latter are wingless and ergatoid as far as observed (Wheeler 1914). The bluish black color of *peninsulatum* might lead to confusion with *cyaneum*, but the apterous condition of the latter makes the distinction possible, and also their wide geographic separation lends support to this judgment. From *M. carbonarium* F. Smith and its subspecies *ebeninum* Forel, all of the above species may be differentiated by the rounded shape of the epinotum and the superior border of the petiolar node, as these structures are angular and the node has the upper surface weakly notched in the former insects.

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GREGG — *Monomorium peninsulatum* sp. nov.

PANORPIDÆ FROM CHINA (MECOPTERA)¹

By F. M. CARPENTER
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Among the Chinese Panorpidæ in the Museum of Comparative Zoology there are several specimens which were not treated in my previous paper on Mecoptera from China.² Most of these were collected by Gaines Liu in Anhwei and Szechwan Provinces, but a few were obtained by L. Gressitt in Kiangsi and Kwantung. They form the basis of the present paper, which also includes the description of a new species in the U. S. National Museum, and notes on Navas' types in the Muséum National in Paris.

Genus PANORPA Linn.

Including the two described below, nineteen species of this genus are known from China.

Panorpa obliqua, n. sp.

Plate 10, fig. 2, 3, 8; plate 11, fig. 9.

Body brown, with the vertex, thoracic nota and abdominal tergites very dark brown. Fore wing: length, 12 mm.; width, 3.5 mm.; membrane faintly yellow, markings brown; apical³ band greatly interrupted, maculate; pterostigmal band complete, connecting with a more proximal band to form a large "V" near the middle of the wing; basal band interrupted, consisting of a large rounded spot on the anterior margin, and an irregular patch along the posterior margin; 2nd basal spot well developed, first absent or very small; both marginal spots absent. Cross-veins not margined. Hind wing: similar to the fore in markings, except that the left "arm" of the "V" is usually interrupted. Anal horn absent. ♂ genitalia: genital bulb rounded, forceps

¹ Published with the aid of a grant from the Museum of Comparative Zoology at Harvard College.

² Proc. Ent. Soc. Wash., 1938, 40:267-281.

³ I have used here the same terminology for wing markings and genitalia as employed in my revision of the Nearctic Mecoptera (Bull. Mus. Comp. Zool., 1931, 72:205-277).

short, outer margins slightly concave; prominent lobes on inner margin of forceps near the base; hypovalvæ short, uniting near the middle of the genital bulb, and extending slightly beyond the base of the forceps; ventral valves simple, each consisting of a slightly flattened process, with a few short barbs on inner surface distally, and terminating in a longer series of barbs directed inwards; preëiproct much narrowed distally, with a pair of broad terminal lobes, close together. ♀: internal skeletal plate of ninth segment large, with two long, slender distal processes and a pair of large, ear-like flaps laterally; the usual axis is short, but there is a very slender median process extending posteriorly.

Holotype (♂): Museum of Comparative Zoology, no. 27325. Hong San, S. E. Kiangsi Province, China. June 28, 1936 (L. Gressitt).

Allotype: same collecting data as holotype, except for date — June 29, 1936; in Museum of Comparative Zoology.

Paratypes: 1 ♀, same collecting data as holotype, except for date — June 30, 1936; in the Museum of Comparative Zoology.

This strikingly marked species is easily recognized by the oblique stripe traversing the middle of the wing, and extending posteriorly and distally from the anterior margin. The short hypovalvæ of the male genital bulb are unique among the known Chinese species of *Panorpa*, but are very much like those of certain Japanese and Siberian species (e.g., *P. wormaldi* MacL., *preyeri* MacL., etc.) to which *obliqua* is undoubtedly closely related. Certain North American species of *Panorpa* (e.g., *lugubris* Swed., *nuptialis* Gerst., *rufa* Gray) have similar hypovalvæ, but their other genital structures are very different from those of *obliqua* and the other Asiatic species indicated.

Panorpa tetrazonia Navas

Plate 10, fig. 1, 5, 6; plate 11, fig. 10.

Panorpa tetrazonia Navas, 1935, Notes d'Ent. Chin., Mus. Heude, 2 (5):96, fig. 61.

This species was based on a single male from Kuling, Kiangsi Province, and deposited in the Musée Heude, Shanghai. In the Museum of Comparative Zoology there are four males and five females which I consider to be this species. Four of these (1 ♂, 3 ♀) were collected in Taipingshien, Anhwei Province, China, October 1932 (G. Liu); and the others on Huang Shan, in

Anhwei, only a few miles southwest of Taiping. These localities are only about one hundred miles from the type locality, Kuling, in northern Kiangsi Province.

The wing markings of the Anhwei specimens are identical with those shown in Navas' figure of the wing, and the general body structure fits his description. I have therefore redescribed the species here on the basis of the new specimens, although a study of the genitalia of the type will be necessary before the specific determination is certain.

Body light to dark brown, the thoracic nota and abdominal tergites being somewhat darker than the rest of the body. Fore wing: length, 12-13 mm.; width, 3-3.5 mm. Membrane faintly yellow, markings brown, apical band interrupted posteriorly and usually with a few small clear spots around the cross-veins; pterostigmal band complete, forked posteriorly; between pterostigmal and basal bands an elongate spot at anterior margin; basal band complete but slender; first basal spot present, second basal and both marginal spots absent. Cross-veins not margined. Hind wing: similar to the fore in markings, except that the basal band is interrupted and the first basal spot is absent. Anal horn absent. ♂ genitalia: genital bulb oval; forceps moderately long, slender, the outer margins not concave; forceps with prominent lobes; hypoalvæ broad and short, not extending as far as the bases of the forceps; ventral valves conspicuous, each arising from a very slender stalk which widens abruptly and gives rise to a long curved process; the wide head of the stalk and the curved process bear numerous long barbs; preëiproct with a shallow distal concavity. ♀: internal skeleton of ninth abdominal segment, with broad plate and short axis; anterior processes of plate slender and convergent distally.

Although the wing pattern of this *Panorpa* is not very distinctive, no other known Asiatic species has precisely the same markings. The male genital structures, especially the ventral valves, are most unusual, as is also the form of the internal skeleton of the ninth abdominal segment of the female.

Panorpa lutea, n. sp.

Plate 10, fig. 7; plate 11, fig. 11.

Body reddish brown, darker brown on vertex, thoracic nota and abdominal tergites. Fore wing: length, 15 mm.; width, 3.5 mm. Membrane deep yellow or orange, markings dark brown;

apical band separated by a wide hyaline stripe into a large anterior apical area and a small posterior spot; pterostigmal band entire, forked posteriorly; a short rectangular spot between the pterostigmal and basal bands; basal band complete and very broad; first basal spot present, second and both marginal spots absent. Cross-veins not margined. Hind wing: similar to fore wing in markings. ♀: internal skeleton of ninth abdominal segment small, with a very short axis and convergent posterior processes. ♂ unknown.

Holotype (♀): Museum of Comparative Zoology, no. 27326. Huang Shan, Anhwei Province, China (G. Liu). A second female (in poor condition) was collected on Kinhua Shan, Anhwei, China, October 1932 (G. Liu).

This strikingly marked species is unlike any other described Asiatic species of *Panorpa*. The male should be easily recognized by the orange color of the wings.

Panorpa davidi Navas

Plate 10, fig. 4.

Panorpa davidi Navas, 1908, Mem. Real. Acad. Cienc. Barc., 1908: 415, fig. 19a,b. Esben-Petersen, Coll. Selys, 1921, 5(2): 29, fig. 21-23.

The type of this Tibetan species has been redescribed and figured by Esben-Petersen (1921), but his drawing does not show clearly the characteristics of the male genital bulb. I therefore include here a figure of the genital bulb of the type which I made at the Muséum National in Paris in 1938. The hypovalvæ and ventral valves are slender and long, and the inner surface of the ventral valves bears a series of short barbs. At the base of the forceps the bulb itself gives rise to a prominent papilla, along the inner surface of which there is a row of stout hairs. An excellent photograph of the wings has been published by Esben-Petersen.

Genus NEOPANORPA Weele

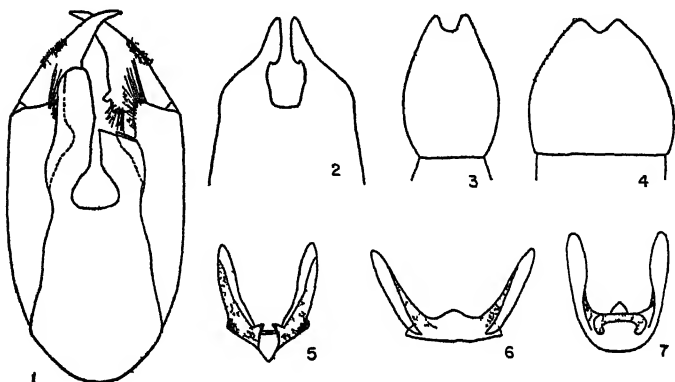
Including the three described below, twelve species of *Neopanorpa* are known from China.

Neopanorpa parva, n. sp.

Text-figures 3, 5; Plate 11, fig. 13.

Body: light to dark brown, darker on vertex, thoracic nota and abdominal tergites. Fore wing: length, 11-13 mm.; width,

2-2.8 mm. (holotype, length, 11 mm.; width, 2 mm.) wing membrane hyaline, markings gray-brown; apical band broken posteriorly; pterostigmal band wide and forked posteriorly; basal band reduced to a few spots. ♀: subgenital plate slender



Text-figures 1-7. Fig. 1. *Neopanorpa pilosa*, n sp., ventral view of male genital bulb (holotype). 2. *Neopanorpa pilosa*, n.sp., distal part of preëpiproct of male (holotype). 3. *Neopanorpa parva*, n.sp., subgenital plate of female (holotype). 4. *Neopanorpa cavaleriei* Navas, subgenital plate of female. 5. *Neopanorpa parva*, n sp., internal skeleton of ninth abdominal segment of female (holotype). 6. *Neopanorpa pulchra*, n sp., internal skeleton of ninth abdominal segment of female (holotype). 7. *Neopanorpa cavaleriei* Navas, internal skeleton of ninth abdominal segment of female.

with a narrow distal incision; internal skeleton of ninth abdominal segment small, with nearly parallel arms and very short axis. ♂ unknown.

Holotype (♀): Museum of Comparative Zoology, no. 27327. Kwanshien, Szechwan Province, China, July 16, 1937 (G. Liu).

Paratypes: 4 ♀, same collecting data as the holotype; in Museum of Comparative Zoology.

This species has wing markings resembling those of *N. cavaleriei* Navas, but it is much smaller than the latter and the wing membrane is hyaline, not yellowish.

Neopanorpa cavaleriei Navas

Text-figures 4, 7.

Neopanorpa cavaleriei Navas, 1908, Mem. Real. Acad. Cienc. Barc., 1908: 415, fig. 23. Esben-Petersen, 1921, Coll. Selys, 5(2): 83, fig. 93, 94.

I have determined as this species one female from Yim Na San, East Kwantung Province, June 16, 1936 (L. Gressitt). It

is the same size and has the wing markings and color of the male ♂ type, which I examined in the Muséum National in Paris. The type locality of *cavaleriei* is Kweiyang, Kweichow Province, some 600 miles from East Kwantung, but Navas has also recorded the species from Tonkin, Indo-China, and "Tibet." The subgenital plate of the specimen from Yim Na San is shown in figure 4, and the internal skeleton in figure 7. The latter is somewhat like that of *parva*, but has blade-like and twisted arms. The wing membrane and markings of *cavaleriei* are similar to those of the Formosan *N. ophthalmica* Navas, but the internal skeletal plate of the female of *ophthalmica*, which is well represented in the Museum of Comparative Zoology, is very different from that shown in figure 7.

Neopanorpa pulchra, n. sp.

Text-figure 6; Plate 11, fig. 12.

Body light brown, slightly darker above. Fore wing: length, 14 mm.; width, 3 mm. Membrane hyaline, markings gray-brown. Apical band wide and entire, contiguous with pterostigmal band along costal margin; pterostigmal band wide, with a short fork posteriorly; basal band entire. Subgenital plate like that of *parva* but with a more shallow distal notch. Internal skeleton broader than long with widely divergent arms and no axis. ♂ unknown.

Holotype (♀): Museum of Comparative Zoology, no. 27328. Ta Han, Hainan Island, Kiangsi Province, June 23, 1935 (L. Gressitt).

There is a second specimen in the collection which almost certainly belongs to this species, but since the end of the abdomen has been broken off, I have not designated it a paratype. It was collected at Hong San, southeast Kiangsi Province, July 15, 1936 (L. Gressitt).

This species has the general wing pattern of *parva* but the wing is more slender and has more extensive markings. The internal skeleton differs in having widely divergent arms.

Neopanorpa pilosa, n. sp.

Text-figures 1, 2

Body light brown, the vertex, thoracic nota and first four abdominal tergites dark brown. Male with the median process of the third abdominal tergite well developed, reaching almost

to the anterior of the fourth segment. Fore-wing: length, 17.5 mm.; width, 3.8 mm. Wing membrane nearly hyaline, faintly smoky in appearance; no markings; pterostigma pale yellow. ♂ genitalia: genital bulb slender, forceps rather short, outer margins gently curved, and with a large cluster of short black hairs near the middle; each of the forceps has a prominent lobe on the inner margin near the base, bearing a number of long black hairs; similar hairs arise from a short papilla on the genital bulb at the base of the forceps; hypoalvæ broad and long, reaching well beyond the base of the forceps; each is folded along the outer margin; preëpiproct with a pair of thick, distal processes, enlarged distally and directed inward towards the interior of the bulb. ♀ unknown.

Holotype (♂): United States National Museum. Suifu, Szechwan Province, China; 1000 ft. August 1928 (D. C. Graham).

This species bears some resemblance to *nigritis* Carp. but is much larger and has a lighter body. The male is readily distinguished by the long hypoalvæ and the patch of hairs on the forceps.

EXPLANATION OF PLATES

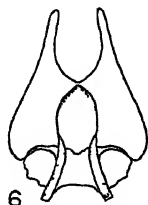
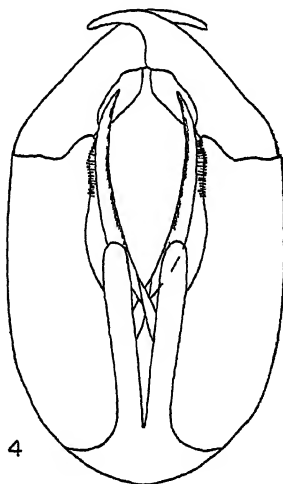
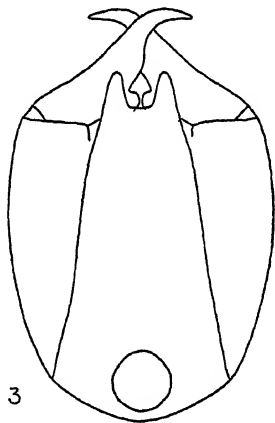
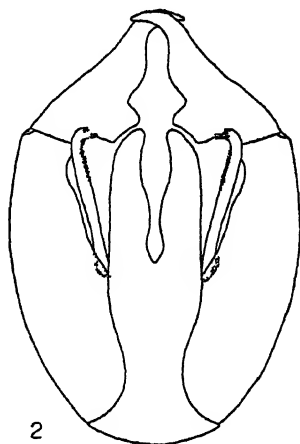
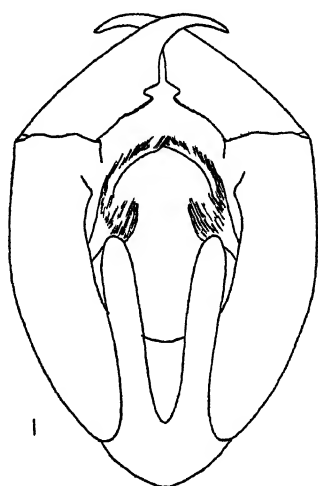
Plate 10

- Figure 1. *Panorpa tetrazonia* Navas, ventral view of male genital bulb.
Figure 2. *Panorpa obliqua*, n.sp., ventral view of male genital bulb, holotype.
Figure 3. *Panorpa obliqua*, n.sp., dorsal view of male genital bulb, holotype.
Figure 4. *Panorpa davidi* Navas, ventral view of male genital bulb, holotype.
Figure 5. *Panorpa tetrazonia* Navas, distal part of preëpiproct of male.
Figure 6. *Panorpa tetrazonia* Navas, internal skeleton of ninth abdominal segment of female.
Figure 7. *Panorpa lutea*, n.sp., internal skeleton of ninth abdominal segment of female, holotype.
Figure 8. *Panorpa obliqua*, n.sp. internal skeleton of ninth abdominal segment of female, allotype.

Plate 11

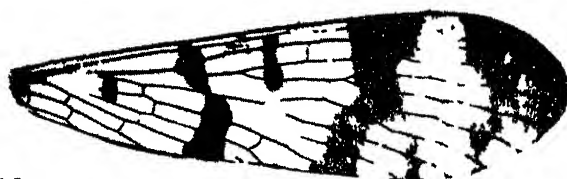
The photographs do not indicate relative sizes.

- Figure 9. Fore wing of *Panorpa obliqua*, n.sp., allotype.
Figure 10. Fore wing of *Panorpa tetrazonia* Navas.
Figure 11. Fore wing of *Panorpa lutea*, n.sp., holotype.
Figure 12. Fore wing of *Neopanorpa pulchra*, n.sp., holotype.
Figure 13. Fore wing of *Neopanorpa parva*, n.sp., paratype.





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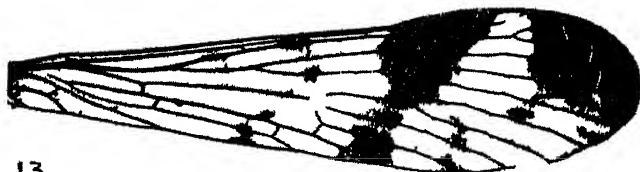
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TEN NEW SPECIES OF EMPIDIDÆ (DIPTERA)

By A. L. MELANDER
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In collecting any group of insects some species are rarely encountered while others are common. In the Empididæ species of *Empis*, *Hilara*, *Rhamphomyia* and *Platypalpus* are numerous and are frequently taken, but it is a fortunate day when the collector can find a *Ragas*, a *Gloma*, or an *Anomalempis*. These last three represent archaic genera, and perhaps in their conservative characters they are handicapped in competition with those genera where speciation runs rife.

In the following pages are presented descriptions of ten new Empididæ, selected because of rarity or other noteworthy interest. Unless otherwise mentioned the specimens were collected by myself and the types are in my extensive collection of this family.

Anomalempis archon, n.sp.

Female. Length 3.75 mm. Entirely black, the halteres, pulvilli, abdominal hairs and terminal fringe of abdomen alone whitish. Sides of front coarctate, at middle one-fifth the length between antennæ and front ocellus, hairs of occiput conspicuous. Dorsum of thorax and abdomen polished, pleuræ and coxæ gray pruinose, dorsocentrals in more than single row, acrostichals biseriate, notal hairs long and thin. Hairs of middle coxæ longer than trochanters, all femora with setæ underneath, each tibia with about six extensor setæ. Wings hyaline, stigma narrow, pale brown.

Holotype: Katmai, Alaska, August, 1917, received from Professor J. S. Hine.

A larger and more bristly species than *A. tacomæ* Melander from Mount Rainier, Washington, but in structure and neuration exactly resembling the figure in Genera Insectorum, fasc. 185, pl. 5, f. 39 (not f. 38, which is *Syndyas polita* Loew). In the Washington species the sides of the front are much less

bowed and the width is one-half the height; the femoral setæ are lacking, the hind tibiæ have but a single seta, and the coxal hairs are shorter.

Chersodromia megacetes, n. sp.

Length 2 mm. Body black, thinly coated with cinereous pollen except the following polished places: face, proboscis, a narrow vertical stripe on sides of lower occiput, mesonotum except a narrow margin on sides and rear, most of sternopleura, terminal plate of pygidium and side of front coxæ. Palpi yellowish. Mesonotal hairs abundant, dark, leaving two approximated glabrous stripes anteriorly, separated by the biseriate hairs of the median line; scutellum thinly cinereous, two apical scutellars. Last tergite of abdomen of male somewhat enlarged on the left side; pygidium enormous, massive, twisted to the right, ventral bowl nearly twice as long as wide, below and laterally on the right side with a few short hairs, left side above with a shining spatulate valve, terminal disk rounded triangular; last segment of female abdomen compressed and shining, as long as other single segments. Legs black, the knees, extremities of tibiæ and the tarsi fuscous; femora without bristles other than a small one near knee, hind tibiæ with a few small bristles on apical half and inwardly with a terminal lappet, middle tibiæ with a flexar comb of short setulæ. Wings and veins whitish, the costal bristle black but the minute hairs whitish, crossveins touching, or the posterior crossvein slightly before the anterior; halteres wholly white.

Type, allotype and seven paratypes: Corona del Mar, California, 28 December 1944. Seven additional paratypes from the same locality, 25 July 1942, from Laguna Beach, 25 January 1935 and 22 May 1944, and from San Clemente Beach, 23 May 1944. In all, five males and eleven females were taken. The insects occur on the dry sand above the line of washed-in seaweed. They are reluctant to fly, can be driven into the collecting net, and are prone to take refuge in the burrows of Amphipods.

The species name, while literally meaning a great whale, has been applied to anything excessively large. In the present instance the monstrous pygidium, bulking as much as the remainder of the abdomen, and relatively larger than possessed by any other fly, warrants even this hyperbolic appellation.

Chersodromia insignita, n.sp.

Length 2 mm. Body black, overlaid with brownish gray pruinosity, the sternopleura mostly polished; hairs and bristles black; base of legs dark; wings maculate. Front about twice as long as width at middle, sides of face diverging below, the face about three times as long as width at antennæ; two vertical bristles, one pair each of converging and diverging ocellar bristles; antennæ black, third joint orbicular, style subdorsal, about three times length of third joint; proboscis black, but little projecting beyond the palpi, which are large, flat, orbicular and glistening white in the male and dusker but glistening in the female. Two dorsocentrals, one humeral, three intra-alar, one post-alar, scutellum with two bristles and two small lateral hairs. Abdomen of male stoutly cylindrical; seventh tergite oblique, lengthened on right side and with hind margin setose, eighth segment filling in the shortened left side of the seventh segment as a shining black triangular plate which is long-setose behind; abdomen nearly bare; pygidium massive, shining above, the globular ventral part pruinose like the preceding abdominal segments, claspers wide and stout. Coxæ mostly blackish, legs robust, all femora stout, piceous, knees, tibiæ and base of tarsi brownish; front tibiæ swollen and bearing a preapical flexar bristle, middle tibiæ with two widely separated extensor bristles, of male narrowed on apical third where there is a flexar strigil of about ten short spines, hind tibiæ with about ten irregular bristles toward tip; metatarsi cylindrical, the front ones two-fifths the tibial length. Wings fully developed, basal half whitish hyaline, with a strong sudden infumation in marginal cell beginning opposite crossveins and diminishing but pervading apical half of wing, veins white to, and including, crossveins but apically brownish, costal ratio 12:4:6:3, basal costal bristle black, costal hairs black, hairs of hind margin pale, second vein noticeably diverging from third, sections of fifth vein 5:4; halteres black, the short stalk brown; alulæ and hairs blackish.

Monterey, California; 25 September 1934, twelve specimens.

This is the only species of *Chersodromia* having an extended stigmatic spot on the wings.

Coloboneura nubifera Coquillett, from Alaska, likewise possesses a dark wing-cloud. It measures three to four millimeters and differs in having the darkening of the wings restricted to

the anterior distal quarter of the wing and in having the second basal cell shorter than the first.

Chersodromia cana, n.sp.

Female. Length 1.4 mm. Body and legs wholly black, more or less overlaid with white-gray pruinosity which is dense on the thorax except the sternopleural spot; all hairs white, all bristles short and black; halteres and palpi white. Front twice as long as width at bottom, face with coarctate sides, five times as long as narrowest width, two pairs of verticals, one of frontals; second joint of antennæ nearly equal to the rounded third joint, style subapical, about twice as long as the third joint; proboscis retracted. Dorsum of thorax rather evenly covered with appressed white hairs, scutellum with two bristles and two lateral white hairs, one each of humeral, notopleural, propleural and intra-alar. Vestiture of abdomen sparse, last segment compressed. Middle tibiæ with two extensor bristles, hind tibiæ with two extensors near middle and three before tip, front tarsi shorter than tibia, the joints almost globular, the first joint not twice as long as wide. Wings milky white, no stigma, basal costal bristle black, all hairs of wing margin small and white, veins white on basal half and gray on apical half, costal ratio from humeral crossvein 8:3:5:3, crossvein near middle of fifth vein.

Holotype: Laguna Beach, California, 25 January 1935.

In the European species, likewise, when the dorsocentral bristles are not developed the notal hairs are pale. Our species differs in having the legs completely black. The distinction between bristles and hairs is clearly indicated by the color.

It is worth recording that a specimen of *Chersodromia* which I collected on the beach near St. George, Bermuda, on February 1, 1934, appears to be identical with *Ch. beckeri* Melander from the Baltic Sea. Unfortunately the Bermuda as well as the Baltic specimens are known from females only. It may be that the discovery of males will enable a distinction to be made.

KEY TO THE AMERICAN SPECIES OF *CHERSODROMIA*

1. Mesonotum shining black, no dorsocentrals; pygidium about as large as the rest of the abdomen; legs blackish; halteres white. Cal. *megacetes*, n.sp.
Body overlaid with grayish pollen.
2. Hairs of mesonotum white, bristles black, no dorsocentrals; legs blackish; halteres white. Cal. *cana*, n.sp.

- Hairs and bristles of thorax black, dorsocentrals present though sometimes small. 3.
3. Wing with darkening on apical half; legs fuscous; halteres black; two scutellars; second basal cell longer than first. Cal. *insignita*, n.sp.
Wings without cloud, uniformly whitish; legs and halteres yellowish. 4.
4. Bristles and hairs of costa and notum black; second basal cell shorter than first. North Atlantic Coast. *Houghii* Mel.
Bristles and hairs of costa and notum pale; basal cells equal. Fla. *nana* Coq.

Ragas primigenia, n.sp.

Male. Length 2 mm. Black, with a thin coating of fine brownish pollen. Hairs of lower occiput silky; eyes fully contiguous along the front; ocellar triangle prominent, with five setæ; third antennal joint triangular, twice as long as deep, style one-fourth the length of the third joint, thick, with a small apical seta; proboscis shining, incurved, sharp, in length one-third the head-height. Notum and pleuræ bare of hairs, lateral bristles very small, single hum., ia., and npl., 6 scutellars, dorsocentrals uniseriate, sparse, short, the posterior three longer, acrostichals biseriate, sparse and short. Abdomen nearly bare, pygidium small and open, its valves bifurcate and forcipate. Legs nearly bare, slender, front coxæ studded anteriorly with six stubby spines, front trochanters large and furnished with a curved row of about ten spinous bristles, middle femora beneath near middle with two strong bristles. Wings infumated, veins heavy and dark, stigma strong and elliptical, second basal cell a little longer than the first and parallel-sided, discal cell large, acutely pointed at base, the underside one-fourth its length, third vein ending just beyond tip of wing, its sections 2.5 : 1, sections of fourth vein 1 : 5 : 5, of fifth vein 1 : 2, axilla rounding into the prominent anal lobe; halteres blackish.

Holotype: La Jolla, California, 1 January 1935.

This is the first valid occurrence of this genus in America, the previous citations of *Ragas* having been assigned to other genera. There is only one other known species, *R. unica* Walker, from Europe. It is smaller than our form, lacks the armature of the legs, and has thinner veins. Otherwise the two species are closely related. In Curran's book on the genera of North American Diptera *Ragas* would lead to couplet 33 on page 211, differing in having an almost straight complete auxiliary vein and a full anal angle to the wing.

Gloma fuscipes, n.sp.

Length 3 mm. Body of male piceous black, legs light fuscous; body of female more or less testaceous below, legs mostly yellowish, bristles and hairs shorter than in male. Face deeply recessed; occiput of both sexes blackish, nearly bare behind the orbital fringe; antennæ short, the arista arising from the base of the deflected reniform third joint; proboscis short and fleshy, palpi black and hairy. Humeri marked with a fuscous point, 1 hum., 3 npl., 3 ia., acrostichals long and scattered, biseriate. Abdomen of male shining; hairs at incisures nearly as long as the segments, two irregular intermediate rows of shorter hairs. Hind tibiæ with about seventeen extensor hairs. Wings somewhat smoky, stigma darker, base in female paler than in male, veins thin and piceous, basal cells coextensive, auxiliary vein evanescent toward tip, alulæ pale, the fringe dark.

Type male: Puget, Washington, 4 July 1925; allotype: Potlatch, on Hoods Canal, Washington, 28 July 1917. Four male and three female paratypes, Canyon Creek, 26 July 1925, and Mount Constitution, 31 July 1908, both in Washington; Mount Hood, Oregon, at 3000 ft., 29 July 1921; Moscow Mountain, Idaho, 10 August 1924, and Lookout Mountain, Priest Lake, Idaho, 20 August 1919.

The genus *Gloma* is remarkable in the Empididæ in having the arista truly dorsal on the small stubby reniform third joint. The South American *Hyperperacera* Collin, which also has a dorsal arista, has bristly metapleuræ.

The species of *Gloma* are rarely encountered, and occur in the forests of the Pacific North-west. But three species exist in the American fauna, the earlier references to *Gloma* pertaining to *Oreogeton*, with *Gloma phthia* Walker belonging in *Syneches*.

Gloma pectinipes, n.sp.

Length 4 mm. Similar to the preceding species, but larger and with the hairs and bristles abundant and prominent. Lower occipital hairs numerous. Thorax thinly overlaid with cinereous pollen, a fuscous point on the humeri. Abdomen subshining. Fringe of the hind tibiæ with about twenty hairs. Wings somewhat smoky, stigma darker, veins piceous, alulæ dusky; halteres black. The distinctive characters are given in the following table.

Type and allotype: Seward, Alaska, 26 July 1921, J. M. Aldrich (U.S.N.M.). A paratype, Anchorage, Alaska, 20 July, also from my friend, the late Dr. Aldrich.

KEY TO THE AMERICAN SPECIES OF *GLOMA*

1. Posterior terminal prong of basal valve of pygidium slender and as long as the bunch of preapical hairs (in the European *fuscipennis* Meig. the posterior prong is very thin and much longer than the anterior); coxæ and legs black; radial and cubical veins distinctly stronger than the medial. Wash.

luctuosa Mel.

Posterior prong stout and short, about half as long as the hairs of the preapical group; radial and cubital veins scarcely stronger than the medial. . . 2.

2. Eight or more scutellar bristles, ten or more dorsocentrals; coxæ and legs dark fuscous, both sides of hind femora of male fringed with long hairs, under side of middle femora with about five hairs along the apical half; female black; length 4 mm. Alaska.

pectinipes, n.sp.

Four scutellars, eight or fewer dorsocentrals; coxæ and legs light fuscous, of female paler, hairs of under side of femora not longer than diameter of the femur; female body more or less testaceous; length 3 mm. Ida., Wash., Oreg.

fuscipes, n.sp.

Oreogeton xanthus, n.sp.

Length 7 mm. Male entirely luteous, subshining, female with head and antennæ sometimes blackish, with thin dust; bristles and hairs black. Third antennal joint about as long as deep, shorter than the basal two together, arista apical; proboscis small, fleshy, palpi with numerous bristles. Valves of pygidium deeply emarginate at middle above, the apical corner bluntly digitate, posteriorly with numerous hairs. Middle coxæ with blunt setæ, those of hind coxæ short; male with eight to ten flexar setæ on middle femora rather uniformly distributed, the middle tibiæ pectinate within with fine setæ, and only slightly bent at middle; tarsi simple, last two joints fuscous. Wings with yellowish tinge, stigma slightly darker, veins yellow, the first, second and third setulose above and the second and fourth underneath, sections of fifth vein subequal.

Type and allotype: Mount Baker, Washington, Skyline Trail, 10 August 1925. Six male and five female paratypes: topotypic, and also from Mount Rainier, at White River, 20 July 1924, and Everett, Washington, 4 July 1924.

In the table of species in Fascicle 185 of the Genera Insectorum, page 99, *xanthus* leads to *capnopterus*, but is readily distinct in its yellow color and in having many setæ under the middle femora of the male. *Xanthus* is the only species having

the apical finger of the pygidial valves twisted inward. In all the others (male of *rufus* not in collection) the valve ends in a continuous thin blade-like triangle or hook.

Hilara cavernicola, n.sp.

Length 2.25 mm. Testaceo-fuscous, head and genitalia becoming fuscous; all bristles short. Front of female twice as long as wide, of male two and one-half times, middle frontal seta minute, face as wide as front, gray-dusted, occipital row of brownish hairs inconspicuous, ocellar bristles shorter than style; basal joints of antennæ yellowish, third joint brown, triangular, scarcely longer than deep, style slightly longer than third joint; proboscis brown, palpi yellow, with a single small pale seta and a few small hairs. Thorax dusted with concolorous pollen, not vittate, pleuræ concolorous with dorsum, dorsocentrals uniseriate, about ten in number and similar to the acrostichals which are in four rows with about eight to the inside row, four scutellars. Abdomen of male with yellowish incisures, of female wholly fuscous, hairs sparse, short and pale, pygidium about the size of the fifth segment, the valves with hook-like process at anterior apex. Legs without bristles, slender in all parts, coxæ and legs pale yellow, becoming slightly darker distally where the ends of the tarsi may be light brown, tibiæ almost equal in length to tarsi which are simple and slender, the metatarsi about equal to the two following joints. Wings hyaline, stigma very faint, veins very thin and light brownish, sections of third vein proportioned 1:7:5, of fourth vein 1:4:6, of fifth vein equal; halteres pale yellow, alulæ and fringe pale.

Over one hundred specimens mounted, from Lucerne, Lake Chelan, Washington, 29 July 1919.

Most of the species of *Hilara* are characterized by their males having enlarged front metatarsi. In Europe there are only some half-dozen species which have slender tarsi, and in the United States but one, *H. johnsoni*. The discovery of an additional species which has probably reverted to this generalized condition therefore carries unusual interest. Nearly all the species of *Hilara* frequent open water, over which they weave their aerial dance. The present species was found swarming in an abandoned mine, evidently attracted there by the enclosed darkness rather than by any dampness.

Empis (Enoplempis) ctenocnema, n.sp.

Length 7 mm. Thorax cinereous piceous, notum quadrivittate with brown; four small scutellars. Abdomen with a few lateral setulæ in vertical row on first two segments. Legs including coxæ testaceous, tarsi apically piceous, hind femora slightly swollen and bent at apical fifth but without any hairs at swelling, hind tibiæ with slight swelling on underside toward knee corresponding with femoral bend and with a slight depression corresponding with femoral swelling, fringed on both sides with close black hairs; when the knee is flexed the femoral twist lies between the two fringes.

Two males, one female, Tuxedo, New York, 29 May 1926.

Very close to *E. nodipes* Melander, from New Mexico, to which it leads in the table of species of *Empis*, Trans. Am. Ent. Soc. xxviii, p. 284 (1902). It differs from the description on page 324 only in the structure of the knee specialization of the hind legs.

NOTES ON HIPPOBOSCIDÆ. 19. ADDITIONS TO THE
LARGER SPECIES OF *LYNCHIA*, WITH DE-
SCRIPTIONS OF TWO NEW SPECIES ¹

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Material of the larger species of *Lynchia* studied since the publication of my earlier paper in 1933 (*Psyche*, XL, pp. 68-82) has led me to modify some of my conclusions. *Lynchia wolcottii* Swenk appears to be a valid species and is here recognized as such. The African fly formerly referred to *L. palustris* was misidentified and is now described as a new species. An additional new species of this group is described from Ceylon.

The following emended key supersedes that published in 1933.

1. Mesonotum and disk of scutellum densely and fairly uniformly covered with soft, short hairs, directed backward; scutellum without median longitudinal groove. Frons very wide; inner margins of eyes distinctly converging below; postvertex very short and wide, about one-fourth to one-third the length of mediovertex; frontal bristles numerous, in several irregular rows. Palpi short, at most as long as fronto-clypeus. Wing membrane bare over much of the basal two-thirds (more extensively in the female than in the male). Subcosta (Sc) usually complete, ending in costa. Wing 5.5 to 7 mm. long. *L. pilosa*.
Mesonotum almost bare, except for narrow patches of long hairs behind the humeral callosities and before the scutellum; scutellum with only a few lateral setæ and apical fringes of soft hairs, the disk mostly bare. Palpi at least as long as fronto-clypeus. Upper side of wing mostly covered with microtrichia; only the axillary cell (2d An) or that cell and the hind fourth to half of the anal cell (Cu+1st An) bare 2.
2. Upper side of wing with only the axillary cell (2nd An) mostly devoid of microtrichia. Subcosta (Sc) usually

¹ Published with the aid of a grant from the Museum of Comparative Zoology at Harvard College.

- complete, ending in costa. Frons nearly twice the width of an eye 3.
- Axillary cell (2d An) and hind fourth to half of anal cell (Cu+1st An) devoid of microtrichia 4.
3. Frons very wide, at most as long as wide at postvertex. Frontal bristles fairly numerous, mostly in one rather irregular row. Palpi at most half as long as the height of the head. Wing 7 to 8 mm. long *L. schoutedeni*.
- Frons longer than wide at postvertex. Frontal bristles very few, in one row. Palpi nearly as long as the height of the head. Wing 9 mm. long *L. majuscula*.
4. Frontal bristles few, placed mostly in one, irregular row. Subcosta (Sc) usually incomplete, not ending in costa . 5.
- Frontal bristles numerous, in more than one row. Frons one and one-half times to twice the width of an eye; inner margins of eyes distinctly diverging to postvertex. Subcosta (Sc) usually complete, ending in costa 7.
5. Inner margins of eyes strongly diverging to postvertex; frons wider than an eye in both sexes, slightly narrower in male than in female. Smooth postvertex short and transverse, the anterior margin longer than the sides, usually without median pit. Wing 7 to 8.5 mm. long.
- L. americana*.
- Inner margins of eyes subparallel or slightly diverging. Smooth postvertex rather long and semi-elliptical, the anterior margin about as long as the sides, often with a median pit or rudimentary ocellus 6.
6. Frons narrow, at most as wide as an eye (even in the female), usually narrower. Wing 6.5 to 8 mm. long.
- L. wolcottii*.
- Frons wider than an eye in both sexes, usually much so. Wing 6.5 to 7 mm. long *L. fusca*.
7. Postvertex long, semi-elliptical, the anterior angles broadly rounded, the anterior margin convexly curved and about as long as the sides. Wing 7.5 to 8.5 mm. long (New World and Hawaii) *L. nigra*.
- Postvertex short, more transverse, the anterior angles more abruptly rounded off, the anterior margin much longer than the sides. Wing 8 to 8.5 mm. long (Africa). *L. dukei*.

Lynchia pilosa (Macquart)

Olfersia pilosa Macquart, 1843. See J. Bequaert, 1933, p. 70.

Additional reference: *Olfersia pilosa* Speiser, 1907, in Sjöstedt, Wiss. Ergebn. Schwed. Zool. Exped. Kilimandjaro, II, pt. 10, pp. 4 and 7 (off *Choriotis kori*, Kibonoto, Tanganyika Territory).

Male. — Head seen in front about one and one-quarter times as wide as high; frons at its narrowest about twice as wide as the eye, measured along inner orbits about as long as its greatest width at vertex, the sides converging strongly from vertex to fronto-clypeus in upper half and more gradually in lower half; inner orbits (parafrontalia) very broad, at their widest more than half the width of mediovertex (frontalia), divided into a narrow, smooth and bare juxta-ocular zone and a much wider alutaceous inner zone bearing many soft, yellowish, reclining setæ in several irregular rows; one stiff, long black bristle at inner margin of parafrontalia near upper third and a few similar black bristles (one very long) near fronto-clypeus; one very long and thick, black vertical bristle; postvertex (vertical triangle) very short and wide, semi-elliptical with drawn-out sides, the anterior margin even, without median depression or pit, the occipital margin nearly straight; apex of fronto-clypeus with a narrow, deep median notch, the antero-lateral angles moderately produced. Palpi very short, thick, about as long as fronto-clypeus (measured from ptilinal suture to apical notch), covered with many long, black and yellowish setæ. Dorsal appendage of second antennal segment short, with obtuse apex, bearing apically many long, stiff, black bristles, mostly curved downward. Thorax: anterior margin broadly concave; pronotum exposed from above as a membranous sclerite, the hind margin of which overlaps the anterior margin of mesonotum; humeral callosities short, broadly rounded off at apex; median notal and transverse mesonotal sutures deep and nearly complete. Scutellum transversely rectangular (somewhat as in *Pseudolynchia*), slightly over three times as wide as its greatest length, the anterior (mesonotal) margin nearly straight, the hind margin slightly convex medially, somewhat angular at the sides, without median groove or depression. Thorax (including scutellum) covered uniformly with numerous, short, soft, appressed, yellowish hairs, directed backward and each arising from a small papula; the hairs are stiffer and black on the humeral callosities and notopleura; in addition there are long,

stiff, black bristles as follows: on each side, two on the humeral callosity, three or four at the hind corner of the notopleuron, one prealar, one postalar, one prescutellar, one scutellar (in the side corner), and six on the metepimeron; hind margin of scutellum densely fringed on the sides, weakly in the middle. Legs long and stout; femora much swollen, but without distinctive features; fourth tarsal segment of fore legs not produced, normal; hind tarsal segments broader than usual, densely covered beneath with stiff, black bristles. Wing short and broad; microtrichia covering the membrane except for the following areas: most of axillary cell (2d An), most of first basal cell (R), entire second basal cell (M), and basal half of the combined discal and second posterior cells (M_2); first basal cell (R) long, narrow, parallel-sided; second basal cell (M) short, at most one-third of the length of the first, slightly widened apically and closed by a hyaline, unsclerotized, straight, vertical anterior basal cross-vein (M_3), the upper outer angle being nearly square; subcosta (Sc) usually complete, ending in costa; apical portion of costa (beyond tip of first longitudinal vein) moderately swollen, distinctly thicker than basal portion; longitudinal veins all crowded near anterior margin; costa densely setulose, all other veins bare. Abdomen: one very large sclerotized basal tergite, with straight hind margin, covered with many evenly distributed short setae; remainder of dorsum mostly soft and membranous, without sclerotized plates, uniformly covered with short setae and some larger and heavier ones at extreme sides; one large preanal, sclerotized tergite, sparsely covered with short setae and bearing on each side a group of ten to twelve very strong, spine-like bristles, three to five of which are much longer than the others and placed near the hind margin; venter entirely soft and membranous, fairly uniformly covered with short setae, posteriorly with much longer ones; before the genital opening a pair of small prominent lobes, sclerotized at the broadly rounded tips, which bear many long setae.

Female. — Differs from the male in the following particulars. Frons relatively narrower, at its narrowest about one and two-thirds the width of an eye. Membrane of wing bare over about the basal two-thirds: microtrichia covering only the apical two-thirds to three-fourths of the first posterior cell (R_5), more extensively along third longitudinal vein (R_{4+5}) than at fourth longitudinal vein (M_{1+2}), the apical fifth to fourth of the com-

bined discal and second posterior cells (M_2), and a short area in the tip of the combined third posterior and anal cells ($Cu+1st\ An$).

Total length, from notch of fronto-clypeus to apex of abdomen (alcoholic specimens): 5.5 to 7.5 mm.; length of wing: 5.5 to 7 mm.; width of wing: 2.2 to 2.8 mm.

L. pilosa is isolated in the genus *Lynchia*, owing to the uniform covering of setulæ on thorax and scutellum, the unusual development of the pronotum, the crowding of the longitudinal veins toward the costa of the wing, and the sexual dimorphism in the extent of the microtrichia over the wing membrane. Most of these characters differentiate *L. pilosa* also from the smaller species of the genus *Lynchia*.

Additional Specimens. — KENYA COLONY: Masai Reserve. — UGANDA: Katwe, Toro, one female and two males, off *Lissotis m. melanogaster* (Rüppell) (G. H. E. Hopkins), and one female, off *Francolinus levaillanti mulemæ* Ogilvie-Grant (G. H. E. Hopkins). Maruanaita Hill, Gié, Karamojo, one female, without host (G. H. E. Hopkins). — SOUTHERN RHODESIA: Salisbury, one male, without host (M. C. Z., Cambridge, Mass.). — BECHUANALAND: Ghanzi, Mongalatsila, off *Choriotis kori* (Burchell) (J. Maurice. — Brit. Mus.). — ZULULAND: Nongomo, one male, "ex Paauw" (H. H. Curson).¹ — MOROCCO: Tiznit, two females and one male, off Sandgrouse, *Pterocles orientalis* (Linné) (Col. R. Meinertzhagen).

This species is now known from Zululand, the Orange Free State, Transvaal, Bechuanaland, Southern Rhodesia, Tanganyika Territory, Kenya Colony, Uganda, southern Abyssinia and Morocco. It is normally a parasite of the Otitidæ (Bustards, Koris or Knorhaans) and will probably be found wherever these birds occur. In particular, it should be looked for in the savannas of the Katanga and the northeastern Uele (Belgian Congo), where Bustards are fairly common. The occurrence of this fly on Sandgrouse in Morocco is of unusual interest. The flies were taken on this host in winter (November 6, 1938). Colonel Meinertzhagen (*in litt.*) points out to me that "Sandgrouse inhabit much the same type of country as Bustard and in this particular area of Morocco the Bustard is not uncommon in spring and summer, but absent in winter. It is also to be

¹ "Paauw" is one of the vernacular names of the Bustards in South Africa.

noted that Bustard and Sandgrouse, though not in the least related, are the only bird groups which have a pinkish under-down." I suggest that Sandgrouse and Francolins act as facultative, and perhaps temporary, hosts for specimens of *L. pilosa* that hatch at the season when Bustards are absent.

Bigot (1863, in Maillard, Notes sur l'Ile de la Réunion, 2d Ed., II, p. M38) includes *Olfersia pilosa* in his list of the Diptera of Reunion. If this record was based on a specimen taken in Reunion, it was certainly an erroneous identification.

Lynchia schoutedeni, new species

Lynchia palustris J. Bequaert, 1933, Psyche, XL, p. 71 (♂; off *Haliëtor africanus*, Mongende, Belgian Congo). Not of Lutz, Neiva and da Costa Lima, 1915.

Male. — Head seen in front about one and one-third times as wide as high; frons at its narrowest about twice as wide as the eye, measured along inner orbits distinctly shorter than its greatest width at vertex, the sides converging markedly from vertex to lower third and slightly diverging opposite fronto-clypeus; inner orbits (parafrontalia) broad, at their widest about half the width of mediovertex (frontalia), mostly smooth and shiny; frontal bristles moderately numerous, mostly placed in one irregular row; one very long and thick vertical bristle; postvertex (vertical triangle) rather long and wide, more than one-third of the length of mediovertex, transversely lozenge-shaped, the occipital margin nearly straight, the anterior margin straight and much longer than the sides, with a slight median triangular depression, but without pit; fronto-clypeus deeply notched medially at apex, the antero-lateral angles moderately produced. Palpi short, thick, slightly longer than fronto-clypeus (measured from ptilinal suture to apical notch), densely setulose and with one long bristle near the tip. Dorsal appendage of second antennal segment short and broad, its apical portion bearing many bristles, mostly curved downward. Thorax: anterior margin nearly straight; humeral callosities fairly long and prominent, with broadly rounded apex; median notal and transverse mesonotal sutures deep, the transverse suture broadly interrupted medially. Scutellum semi-elliptical, less than three times as wide as its greatest length, the anterior (mesonotal) margin slightly convex, the hind margin very strongly and evenly so, the disk with a fine longitudinal groove. Thorax mainly bare; a few soft, short and long hairs, directed back-

ward, in a transverse group on each side behind the humeral callosity, far from the middle line; two or three soft setæ on each side just before the scutellum; a few short setæ at apex of humeral callosity, followed by one very long bristle; notopleura with a few scattered short setæ and two long bristles posteriorly; on each side one prealar, one postalar and one scutellar bristle; metepimeron with a few short, stout setæ; scutellum with a fringe of long, soft hairs at hind margin and a few preapical hairs in a transverse row. Legs stout and rather short; femora much swollen, without distinctive features; fourth tarsal segment of fore legs not produced, normal; hind tarsal segments short and broad. Wing short and broad; microtrichia covering the membrane except for nearly the entire axillary cell (2d An); first basal cell (R) long, narrow, parallel-sided; second basal cell (M) long, more than one-third, but much less than one-half of the length of first, moderately widened apically and closed by a partially sclerotized, slightly curved, nearly vertical anterior basal cross-vein (M_3), the upper outer angle being nearly square; subcosta (Sc) complete, ending in costa; apical portion of costa scarcely thicker than basal portion; longitudinal veins evenly distributed; costa densely setulose, all other veins bare. Abdomen: sclerotized basal tergite extending the entire width, bearing few short and soft setæ, the sclerite very short in the middle, produced into long and narrow side lobes; remainder of dorsum mostly soft and membranous, with many short, soft setæ, except for a median almost bare area bearing microscopic transverse striolæ; one small, median, transversely elliptical sclerotized plate a short distance behind the basal tergite and on each side a narrow partly sclerotized pleurite; preanal tergite forming one large, transverse, sclerotized plate, with straight anterior and hind margins and broadly rounded sides, sparsely covered with short setæ and laterally toward the apex with much longer bristles which are not at all spine-like (5 or 6 longer bristles on each side); venter mostly soft and membranous, fairly uniformly covered with short setæ; before the genital opening a pair of prominent lobes, sclerotized at the broadly rounded tips, which bear many setæ.

Total length, from notch of fronto-clypeus to apex of abdomen (alcoholic specimen): 8 mm.; length of wing: 7.8 mm.; width of wing: 2.7 mm.

Female. — Dorsum of abdomen mostly bare and microscopi-

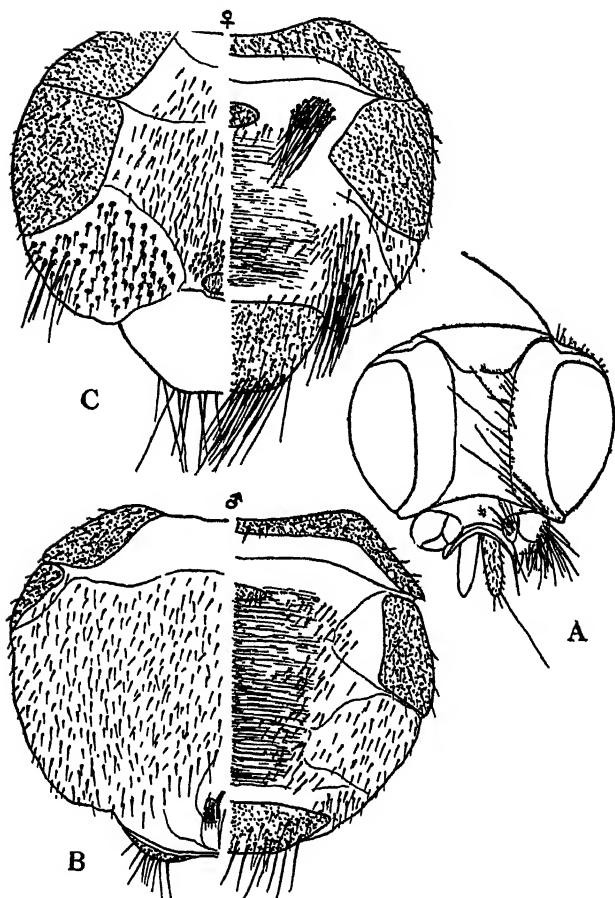


FIG. 1. *Lynchia schoutedeni* J. Bequaert, n. sp. A, head of male holotype; B, abdomen of male holotype from above (right) and below (left); C, abdomen of female paratype, Katwe, from above (right) and below (left).

cally striolate in the middle (as in male); but the sides, beyond the pleurite, with strong setæ which become very long and are more or less crowded into a brush posteriorly; in addition, a large brush-like patch of long and strong bristles on each side anteriorly near the small median, elliptical sclerotized plate. Preanal sclerotized plate semi-elliptical in outline, rounded-truncate behind, the long apical bristles stronger and more nu-

merous than in male (9 to 12 on each side); this preanal sclerite is flattened and completely bare on the ventral side, a striking peculiarity of the species. Apical portion of venter covered with very short setæ arising from unusually large, sclerotized papulæ. Otherwise as in male.

Total length, from notch of fronto-clypeus to apex of abdomen (alcoholic specimen): 8 mm.; length of wing: 7.8 mm.; width of wing: 2.7 mm.

Specimens Examined. — BELGIAN CONGO: Holotype, male, Mongende, off Cormorant, *Haliëtor africanus* (Gmelin) (H. Schouteden. — Congo Museum, Tervuren). — KENYA COLONY: Allotype, female, Naivasha, off *Phalacrocorax carbo lugubris* (Lichtenstein) (A. Meinertzhagen. — Museum Comp. Zoöl., Cambridge). — UGANDA: Male and female paratypes, Entebbe, off *Haliëtor africanus* and off *Anhinga rufa rufa* (Daudin) (G. H. E. Hopkins. — Brit. Mus.). Female and male paratypes, Kampala, off *Anhinga rufa rufa* (G. H. E. Hopkins. — Mus. Comp. Zoöl.). Female and male paratypes, Bulengugwe, off *Anhinga rufa rufa* (W. G. Eggelius and G. H. E. Hopkins. — Brit. Mus.; Mus. Comp. Zoöl.). Male and female paratypes, Katwe, Toro, off *Anhinga rufa rufa* and *Phalacrocorax carbo lugubris* Rüppell (G. H. E. Hopkins. — Mus. Comp. Zoöl.). Male and female paratypes, Kome Island, Lake Victoria (G. D. H. Carpenter. — Brit. Mus.). — ETHIOPIA: Female paratype, Dambi Ford, in tent, probably off a Cormorant (Major Cheesman. — Brit. Mus.). Several specimens are infested with myialgid mites, the infestation being particularly heavy on one of the flies from Katwe, off *Anhinga rufa*.

A study of a cotype of *Olfersia palustris* Ad. Lutz, Neiva and da Costa Lima (1915, Mem. Inst. Osw. Cruz, VII, p. 183, Pl. XXVIII, fig. 4), from the State of Piahy, Brazil, shows that I was mistaken in referring to that species the African parasite of Cormorants. The true *O. palustris* is one of the small species of *Lynchia*, the wing being about 5 mm. long. It is very closely related to, or possibly even identical with, *Lynchia albipennis* (Say).¹

¹ I am indebted to the late Dr. Ad. Lutz for a cotype of *Olfersia palustris*, now deposited at the Museum of Comparative Zoölogy. I surmise that the length of the wing as given originally (7 mm.) was either an oversight or meant to cover the distance from the clypeus to the tips of the folded wings. It should be noted that the total length of the body as given (5 mm.) is too small for any of the large species of *Lynchia*.

For a long time I was undecided as to whether the African parasite were not *Lynchia massonnati* (Falcoz) (*Ornithoponus massonnati* Falcoz, 1926, Faune de France, XIV, Diptères Pupipares, p. 31, figs. 28-29), based upon the female fly off *Platalea leucorodia*, from the region of the Dombes, Dept. Ain, France, which Massonnat (1909, Ann. Univ. Lyon, N.S.,

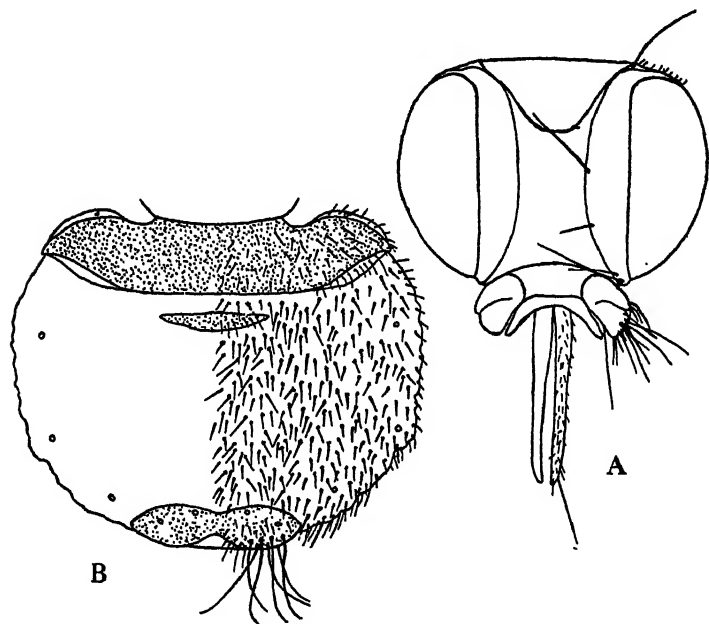


FIG. 2. *Lynchia majuscula* J. Bequaert, n. sp., male holotype. A, head; B, abdomen from above (right) and below (left).

CXXVIII, p. 304, Pl. V, figs. 40-42) had referred to *Lynchia americana*. While it seems fairly certain that Massonnat's fly was not the American *Lynchia americana* (Leach), it does not seem possible to regard it as identical with the African parasite of Cormorants. Neither Massonnat nor Falcoz mentions or figures the peculiar brush-like setæ on the sides of the abdomen. These are so characteristic of the female of *L. schoutedeni* that they could hardly have been overlooked. It is possible, however, that Massonnat's specimen was really a male, in which case it might well have been my new species.

Lynchia majuscula, new species

Female. — Head seen in front slightly wider than high; frons about twice as wide as eye, measured along inner orbits about one and one-third times as long as its width at vertex, with nearly parallel sides; inner orbits (parafrontalia) wide, slightly more than half the width of mediovertex (frontalia); frontal bristles reduced to a small group on the gena near lower edge of eye, and two or three on the middle; one very long vertical bristle; postvertex (vertical triangle) long, more or less triangular and broadly rounded anteriorly, nearly as long as wide and about half as long as mediovertex, apparently without median anterior depression or pit; occipital margin straight; fronto-clypeus of the usual shape, the antero-lateral angles moderately produced. Palpi unusually long and slender, only slightly shorter than the height of the head. Thorax: anterior margin straight medially; humeral callosities broad, moderately prominent, bluntly rounded at apex, with one long bristle and eight to ten short setæ; anterior half of mesonotum (mesoscutum) on each side anteriorly with a narrow, transverse patch of short, soft hairs and a few setæ, the patch not reaching the middle line; one very long prealar bristle; dorsal portion of mesopleura (notopleura) with a few scattered short setæ and, posteriorly, with one long bristle; a few setæ near outer hind margin of mesonotum and one long postalar bristle; hind margin of scutellum evenly and moderately convex, weakly fringed and in each corner with one long scutellar bristle; metepimeron with 5 or 6 strong, short bristles and some softer setæ. Legs without distinctive features; fourth tarsal segment of fore legs not produced. Wing long and broad; microtrichia covering most of the membrane; axillary cell (2d An) bare, except for a very narrow zone along the sixth longitudinal vein (2d An); first basal cell (R) long, narrow, parallel-sided; second basal cell (M) less than half but over one-third of the length of the first, closed by a nearly vertical anterior basal cross-vein (M_3); subcosta (Sc) complete, ending in costa; costa densely setulose; third longitudinal vein (R_{4+5}) with a few setulæ close to the tip; other veins bare. Abdomen: a broad, short, transversely lozenge-shaped basal tergite, followed by a small transverse median sclerite; preanal tergite consisting of two elliptical plates, broadly connected medially and each bearing a group of eight

long bristles and a few shorter ones; remainder of dorsum soft and fairly uniformly covered with many short setæ on small papulæ; in addition the integument of the median area is microscopically, transversely striolate; ventrally there is apparently only one small, crescent-shaped sclerite, placed immediately in front of the anal ring and more or less divided longitudinally; ventral surface uniformly covered with many setæ, slightly



FIG 3 *Lynchia majuscula* J Bequaert, n sp Wing of male holotype Photograph by F M Carpenter

longer than those of dorsum; soft portion of abdomen very superficially divided along the sides into five segments, each corresponding to one of the spiracles.

Total length, from notch of fronto-clypeus to apex of abdomen (somewhat flattened on the slide): 8 mm.; length of wing: 9 mm.; width of wing: 3 mm.

Specimen Examined. — CEYLON: Holotype, female, off a Falcon, *Spilornis cheela spilogaster* (Blyth), April, 1935 (sent by the late Dr. G. A. H. Bedford. — Mus. Comp. Zoöl.).

L. majuscula appears to be most closely related to *L. schoutedeni*, described in this paper, agreeing with it in the characters of the wing. It is, however, slightly larger, being the largest member of the genus I have seen thus far. In addition to the differential characters given in the key, attention may be called to the difference in the pilosity of the dorsum of the abdomen and in the shape of the postvertex.

The description is based on a single specimen mounted on a slide in Canada balsam, after treatment with potash. It is possible that the frontal bristles were actually more numerous on the fresh specimen.

Lynchia americana (Leach)

Feronia americana Leach, 1817; *Hippobosca bubonis* Packard, 1869. See J. Bequaert, 1933, p. 72.

The synonymy, distribution and hosts of this fly will be discussed fully in a forthcoming paper on the North American Hippoboscidae.

L. americana is one of the most common and widespread Nearctic hippoboscids. It is known in the Dominion of Canada from Ontario and Nova Scotia; and in the United States from Maine, New Hampshire, Vermont, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, the District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Louisiana, Texas, Kentucky, Ohio, Indiana, Illinois, Wisconsin, Iowa, Nebraska, Minnesota, Kansas, Colorado and Nevada. Farther south it seems to be very rare, as I have seen only one specimen from Mexico (Grito) and one from Panama (Juan Diaz). The published records from California and the Galapagos were based on misidentifications.

The known host list is very large, but this species is most commonly found on diurnal and nocturnal birds of prey and on Ruffed Grouse. H. S. Peters (1935, Ann. Carnegie Mus., XXIV, p. 57) reported a specimen off an American Egret (*Casmerodius albus egretta* Gmelin), with a Mallophagan (*Esthiopterum botauri* Osborn) attached, a most unusual find. The only record I have from a passerine host is a specimen taken at White Plains, New York, off a White-throated Sparrow, *Zonotrichia albicollis* (Gmelin), by Mr. C. Farley. *L. americana* has become established on the introduced Ring-necked Pheasant, *Phasianus colchicus torquatus* Gmelin.

Since this paper was sent to press, I received from Dr. A. Stone several specimens of *L. americana* taken off Wild Turkey in North Carolina (Durham; Rockingham Co.) and Mississippi (Picayune).

The statement in my earlier paper (1933, p. 75) regarding the occurrence of pupæ in the ears of Great Horned Owl, should be deleted. In C. W. Johnson's paper it refers to *Ornithoica vicina* (Walker) (cited as *O. confluenta*).

Lynchia fusca (Macquart)

Olfersia fusca Macquart, 1845. See J. Bequaert, 1933, p. 77¹; 1940, Rev. Acad. Colombiana Cienc. Ex. Fis. Nat., III, pt. 12, p. 416; 1943, Jl. of Parasitology, XXIX, p. 132.

This species will be more fully discussed in a forthcoming paper.

L. fusca is fairly common in Oregon and California, but it is also found occasionally in the eastern United States (South Carolina, Georgia, Florida, Texas, Tennessee, Kansas, Colorado, and Michigan). It was originally described from Colombia, and has also been taken in Panama and Brazil.

It is mainly found on Owls, more rarely on diurnal birds of prey.

Lynchia wolcottii (Swenk)

Olfersia wolcottii Swenk, 1916, Jl. New York Ent. Soc., XXIV, p. 132 (no sex. Michigan: Ann Arbor, off *Buteo platypterus*).

My surmise that *O. wolcottii* might be a synonym of *L. fusca* (J. Bequaert, 1933, p. 78) was incorrect. Through the courtesy of the late Prof. Myron H. Swenk, I was able to study the type now in the Department of Entomology, University of Nebraska.

Specimens Examined. — MICHIGAN: Ann Arbor, off *Buteo p. platypterus* (R. H. Wolcott. — Holotype). McMillan, off *Accipiter v. velox* (O. M. Bryens, June 6, 1933; recorded also by H. S. Peters, 1936, Bird-Banding, VII, p. 13). — NEBRASKA: Lincoln, off *Buteo p. platypterus* (C. E. Mickel). — PANAMA: El Volcan, Chiriqui, July 6, 1937, off a Hawk (C. B. Worth).

Apparently a rare species, which has been taken thus far only from diurnal birds of prey.

Lynchia nigra (Perty)

Hippobosca nigra Perty, 1833; *Ornithomyia intertropica* Walker, 1849; *Olfersia acarta* Speiser, 1902. See J. Bequaert, 1933, p. 79²; 1933, Proc. California Ac. Sci., (4) XXI, p. 134;

¹ The reference to Ad. Lutz, Neiva and da Costa Lima, 1915, Mem. Inst. Osw. Cruz, VII, p. 182, should be deleted. These authors undoubtedly referred to *L. fusca* some of the smaller *Lynchia* and their specimens seem to have been at least partly *L. angustifrons* (v. d. Wulp). The latter is a valid, distinct species, not a synonym of *L. fusca*. The flies off Owls, which Ad. Lutz, Neiva and da Costa Lima (*op. cit.*, p. 181) called *Olfersia nigra* Perty, were almost certainly *Lynchia fusca* (Macquart).

² The reference to Ad. Lutz, Neiva and Da Costa Lima (1915, Mem. Inst.

1940, Mem. Soc. Cubana Hist. Nat., XIV, p. 322; 1940, Rev. Acad. Colombiana Cienc. Ex. Fis. Nat., III, pt. 12, p. 416; 1941, Occ. Papers B. P. Bishop Mus., XVI, p. 281; 1942, Bol. Entom. Venezolana, I, p. 82.

This species will be fully discussed in the forthcoming revision of North American Hippoboscidae.

Additional Neotropical Specimens. — MEXICO: Nayarit, off "Chicken Hawk" (Amer. Mus. Nat. Hist.). Chichen Itza, Yucatan, off *Geranospiza nigra* (Du Bus), *Buteo magnirostris conspectus* (Peters) and *Asturina nitida plagiata* Schlegel (J. Van Tyne). San Carlos Bay, Sonora, off *Buteo borealis calurus* (G. Augustson). Los Frailes Bay, Lower California, off *Polyborus cheriway audubonii* Cassin (G. Augustson). Pedregal, Munic. Tancitaro, 6,000 ft., Michoacan, off *Buteo borealis* (H. Hoogstraal). La Puerta de Hambre, Munic. Apatzingan, 1,200 ft., Michoacan, off *Falco mexicanus* Schlegel (R. Traub). Apatzingan, Munic. Apatzingan, 1,200 ft., Michoacan, off young Hawk (R. Traub). — REPUBLIC OF HONDURAS: Subirana, Yoro (Stadelmann). — VENEZUELA: San Felipe, off *Herpetotheres c. cachinnans* Linné (P. Anduze). — BRITISH GUIANA: Upper Rupununi River (Ogilvie). — BRAZIL: Maracajú, Matto Grosso, off *Cathartes aura* (Linné) and "gavião" or fulvous-bellied Kite (R. M. Gilmore).

In North America *L. nigra* is known from British Columbia, Quebec, New York, Kansas, Colorado, Utah, Arizona, New Mexico, Montana and Texas. It has also been taken in the Galapagos, Hawaii, and Bolivia.

All the known hosts are diurnal birds of prey.

Lynchia dukei (Austen)

Olfersia dukei Austen, 1911. See J. Bequaert, 1933, p. 80. Since publishing this paper I have examined the type at the British Museum.

Additional Specimens. — BELGIAN CONGO: Butiaba, Lake Albert, off *Haliæetus vocifer* (Daudin) (A. Meinertzhagen). The specimen previously recorded from Ganda Sundi was off *Hieraaëtus ayresii* (Gurney). — CAMEROON: Metet, off a Hawk

Osw. Cruz, VII, p. 181) should be deleted. The specimens which these authors referred to *L. nigra* were almost certainly *L. fusca* (Macquart), while their *Olfersia raptatorum* was possibly *L. nigra*.

(A. I. Good). Lolodorf, off *Gypohierax angolensis* (Gmelin) (A. I. Good). Sangmelima (A. I. Good). — UGANDA: Kampala, off *Polyboroides typicus* (Smith) (G. H. E. Hopkins). Katwe, Toro, off *Haliæetus vocifer* (G. H. E. Hopkins). Entebbe, off *Haliæetus vocifer* (G. H. E. Hopkins). Kaswama, off *Haliæetus vocifer* (G. H. E. Hopkins). Mityama, off "eagle" (G. H. E. Hopkins). — KENYA COLONY: N'gong, off *Buteo rufofuscus augur* (Rüppell) (G. van Someren). — TANGANYIKA TERRITORY: Dodoma, off *Aquila rapax* (Temminck) (A. Loveridge). Magrotto Plantation near Tanga, off *Gypohierax angolensis* (A. Loveridge).

L. dukei is strictly Ethiopian and known at present from Cameroon, French Congo, Belgian Congo, Abyssinia, Uganda, Kenya Colony and Tanganyika Territory. It is the African representative of the New World *L. nigra*, from which it is possibly not specifically distinct.

Like *L. nigra*, it is known only from diurnal birds of prey.

Unrecognized Species

Several of the described, larger species of *Lynchia* cannot be recognized with certainty from the inadequate descriptions. Some of them are evidently synonyms of the species recognized in this paper.

1. *Lynchia massonnati* (Falcoz, 1926). See J. Bequaert, 1933, p. 72, and the discussion of *L. schoutedeni* in the present paper.

2. *Lynchia villadæ* (Dugès, 1887). See J. Bequaert, 1933, p. 76. Possibly a synonym of *L. americana* (Leach).

3. *Lynchia macquartii* (Rondani, 1878). See J. Bequaert, 1933, p. 78. Possibly a synonym of *L. fusca* (Macquart).

4. *Lynchia raptatorium* (Ad. Lutz, Neiva and da Costa Lima, 1915). See J. Bequaert, 1933, p. 82. A synonym of either *L. nigra* (Perty) or *L. fusca* (Macquart). In view of the fact that *raptatorium* was said to occur in several Brazilian localities and on four species of diurnal birds of prey, I now consider that it was most probably *L. nigra*.

5. *Lynchia penelopes* Weijenbergh, 1881. This, the genotype of *Lynchia*, has unfortunately not been seen by any subsequent student. It is doubtful whether the type is still in existence. Specimens should be collected again from the type host,

Penelope canicollis Wagler, in northern Argentina. It is most probably a species distinct from any recognized in the present paper.

6. *Ornithomyia rufiventris* Bigot, 1885, Ann. Soc. Ent. France, (6), V, p. 243 (no sex; no host. Brazil: Porto Alegre). Speiser saw the type and recognized it as a *Lynchia*, a genus which he called *Olfersia* (1902, Zeitschr. Syst. Hym. Dipt., II, p. 169). It was evidently either *L. fusca* (Macquart) or *L. nigra* (Perty), most probably the latter.

7. *Lynchia pallidilabris* (Rondani). *Olfersia pallidilabris* Rondani, 1878, Ann. Mus. Civ. Genova, XII, p. 161 (no sex; no host; Mexico). The size (6 to 7 mm. long) places it among the larger species. One can only surmise that it was either *L. fusca* or *L. nigra*.

TWO NEW SPECIES OF PSAMMOCHARIDÆ¹

BY NATHAN BANKS

Museum of Comparative Zoology

In the course of rearranging the Museum collection of these insects, I found the two following new species.

Arachnophila brevihirta sp. nov.

Extremely similar to *A. divisa* Cresson in structure and color, the first two segments of abdomen being rufous above. On the propodeum the dorsal groove is scarcely, if at all, visible (distinct in *divisa*). In the wings there are two slight differences; in the twelve specimens of *divisa* before me the third submarginal cell is triangular but not pedicellate, and the basal vein is exactly interstitial with the transverse; in the eight specimens of *brevihirta* the third submarginal cell is distinctly pedicellate, and the basal vein ends a trifle before the transverse. The fine hairs on body and femora are shorter, except those at and near tip of abdomen, which are as long as in *divisa*; those on head nearly one-half shorter, those on pronotum still shorter, those on propodeum fully one-half shorter, as are also those on basal part of abdomen; those on the femora are fully one-half shorter, this is most noticeable on the hind femora where the hairs are less than one-half the breadth of the joint (in *divisa* as long as breadth of joint).

Length of fore-wing 5.5 to 7 mm.

Type from Chicago, Ill. July (C. T. Brues) M.C.Z. No. 26739; paratypes from Chicago, Ill.; Roggen, Colo. August (Rodeck); Sheldon, N. Dak. August (Stevens); Benzie Co., Mich., July (Dreisbach); and two with less red on abdomen from Chipawa Co., Mich., July (McAlpine); and Huron Co. Mich., August (Gauge).

The *Arachnophila septentrionalis* Kincaid from Alaska is

¹Published with the aid of a grant from the Museum of Comparative Zoölogy at Harvard College.

probably not an *Arachnophila*, for nothing is said about hair on abdomen and femora and the third submarginal cell is far from being triangular.

Ageniella pallida sp. nov.

Pale yellowish to pale rufous throughout, the only dark mark is the extreme base of the petiole; legs pale yellowish, also basal part of antennæ (rest broken), body slightly sericeous on coxæ and pleura. Wings hyaline, veins and stigma pale yellowish. Very little hair on body, a few fairly distinct at tip of abdomen. Clypeus nearly three times as broad as long, lower edge convex, few small hairs; face about as broad as high, not narrowed above, no distinct frontal groove; lateral ocelli very much closer to each other than to eyes; pronotum about as long above as in *accepta*, arcuate behind; propodeum plainly longer than broad, no median groove, seen from side evenly convex; petiole moderately long, abdomen much broader than propodeum; legs rather slender, hind femora reach tip of abdomen; mid and hind tibiæ with a few short spines above, mostly in rows, inner spur of hind tibiæ about one-third of basitarsus.

In fore-wings the marginal cell is about its length from tip, upper and lower sides parallel for some distance, tip rather blunt, a little broader than second submarginal cell, latter small and little longer below than broad, narrowed nearly one-half above, receiving the first recurrent vein scarcely more than one-fourth from base; third submarginal cell almost twice as long below and fully twice as long above as the second cell, outer side scarcely oblique, but a little curved above, apex of cell only a trifle broader than base, receiving second recurrent vein just before middle; basal vein ends plainly before transverse; in hind wings the anal vein ends much before forking of cubitus, outer cross-vein much nearer base of radial sector than to tip.

Length of fore-wing 5 mm., of body 7.5 mm.

One female from Austin, Texas (Graenicher coll.).

Type M. C. Z. No. 26738.

Its generally pale color, the parallel-sided marginal cell, and the shape of third submarginal cell all separate it from our other species of the genus.

NOTES ON THE LIFE HISTORY OF
PERIPLANETA FULIGNOSA SERV.BY PHIL RAV
Kirkwood, Missouri

In a lot of *Periplaneta americana* that came from New Orleans in June 1937, there were three adult females which resembled *P. americana* in size and shape, but the color, instead of being golden-brown, was a dull brownish-black or "off-black." I became suspicious about the species later when the egg-cases began to protrude from their bodies, for they were almost twice the size of those deposited by *P. americana*.

Specimens of the nymphs, which so little resembled either *fulignosa* or *americana*, as well as the mother, were sent to Mr. Morgan Hebard, who named them *Periplaneta fulignosa* Serv. They have been recorded only from southern United States, where they are common in storehouses, docks, etc. He is quite sure that this species, like other members of the genus, is an adventive in America from the old world. He added the note "that the nymphs are so parti-colored that they might have been mistaken for *Periplaneta brunnea*, another adventive pest, were it not known that they were the immature insects of the adult sent to me."

Four egg-cases were obtained from the three females, and from them hatched 22, 22, 26, and 26 young respectively. This is almost twice the number per egg-case than for its contemporary, *P. americana*.

One female that became adult on June 29 protruded her first egg-case 12 days later, and another egg-case after 11 days. In two cases, notes were made on the period of incubation: one protruding egg-case removed from the mother's body on July 10 gave forth its nymphs August 13; the other egg-case, removed from another mother on June 14, gave forth its young on July 31, the two having a period of incubation of 35 and 47 days respectively.

The young nymphs ate readily of cinnamon roll, could neatly hollow out a grain of corn, and drank much water. They

were very lively, ran about the jar rapidly and in their efforts to escape easily walked over the band of vaseline that was spread to prevent their leaving the jar. When they run about they curl up the ends of their abdomens very much like rove beetles; the young of *Parcoblatta pennsylvanica*, *Blatta orientalis*, or *Periplaneta americana* do not have this peculiar behavior.

On hatching, the nymphs are black with white bands on two abdominal segments; the basal segment and one in the middle. Several weeks after hatching I noticed that the first 4 or 5 joints of the antennæ were also white. A month or six weeks later, probably after a moult, the white band on the middle segment became broken so that the center third of it was black. I found still later that both of the white segments in all nymphs in this jar changed to an inconspicuous light brown color while the insect itself was still dull black. On that day I was again surprised to find that in addition to the 4 or 5 segments of white at the tip of the antennæ there was a white portion covering one-fourth of the antennæ at its point of attachment. By August 31, they had grown to about one-half inch in length, and when a moult occurred on November 7, the few that had not died were of a light brown color, resembling very much the half-grown nymphs of *P. americana*.

I do not know if the nymphs I have obtained are pure *P. fuliginosa* or hybrids between them and their traveling companions, *P. americana*. If the three females of *P. fuliginosa* were trapped in New Orleans just before shipping to St. Louis, it is likely that they mated with their own species, but if they grew up among the *americana* in the breeding cages of the dealer, from whom I obtained them, it is quite likely that they were fertilized by the males of *americana*. Then again, they might have been bred in confinement for a number of generations with the result that crossings and re-crossings often may have occurred. The fact, however, that the few roaches which reached middle age became more and more like *P. americana* leads me to believe that the nymphs which Mr. Hebard said could easily be mistaken for *P. brunnea* are not pure stock, but are of hybrid origin, mixed with *americana* for one or more generations.

OBSERVATIONS ON THE SUBGENUS
RHACHIOCREMA (HYMENOPTERA: FORMICIDÆ)
WITH THE DESCRIPTION OF A NEW
SPECIES FROM BORNEO

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Of the several subgenera of *Crematogaster* perhaps the least known is *Rhachiocrema*. The species which belong to this subgenus possess enormously developed epinotal spines. These arise from a relatively narrow thorax but project rearward at a very wide angle so that the distance between their tips exceeds the width of the head or gaster. Up to the present *Rhachiocrema* has been represented by only two species, *wheeleri* from the British Solomon Islands and *paradoxa* from New Guinea. This paper carries the description of a third species from Borneo. References to *Rhachiocrema* in the literature are scattered and brief. As far as can be determined it has been mentioned only three times since its original description. It is regrettable that two of these references contain serious factual errors. In one case the error has gone uncorrected for more than twenty years. This is not surprising in view of the rarity of the species involved. It has recently been my good fortune to receive a small collection of ants taken in New Guinea by Pvt. Howard Levy, Sn.C., a former City College student. This collection contained four species of *Crematogaster*, three of which have a bearing on the status of *Rhachiocrema*. A study of these specimens and a review of the literature both indicate that considerable clarification is needed in the case of this subgenus.

Rhachiocrema was erected as a subgenus by Mann in 1919 (1). Among the ants which he collected in the British Solomon Islands was a remarkable *Crematogaster* taken in the mountains on the island of Malaita. He described this insect as the species *wheeleri* and designated it as the type of the new subgenus *Rhachiocrema*. The only other member of the subgenus cited by Mann was *paradoxa*, a species from New Guinea which Emery had described in 1894 (2). In view of subsequent events

it is worth repeating that, as delimited by Mann, the subgenus *Rhachiocrema* contained only two species, *wheeleri* and *paradoxa*. Other features connected with Mann's characterization of *Rhachiocrema* were by no means so clear. The antennæ were said to be elongate, twelve-jointed and with a distinct two-jointed club. The first and last of these characters would not, of themselves, confer distinction since several species in the subgenus *Orthocrema* have elongate antennæ with two-jointed clubs. But the number of antennal joints, as given, is unique for *Crematogaster*. All other known species have eleven-jointed antennæ or, in the case of the subgenus *Decacrema*, ten- or nine-jointed antennæ. If *Rhachiocrema* possessed twelve-jointed antennæ its status could be defended without reference to any other structure. Unfortunately this is not the case. Mann overlooked the fact that Emery had described *paradoxa* as having eleven-jointed antennæ, and he miscounted the antennal joints of *wheeleri*. Both species have eleven-jointed antennæ and Mann's description and figure of *wheeleri* cannot be relied upon in this particular. When Wheeler published a key to the subgenera of *Crematogaster* in 1922 (3) he included *Rhachiocrema* with that group of subgenera which have eleven-jointed antennæ. Although no comment was made concerning the correction it may be presumed that it was based upon an examination of type specimens of *wheeleri*. To make certain that there is no further confusion in this matter I requested Prof. F. M. Carpenter to examine the type material of *wheeleri* in the collection of the Museum of Comparative Zoology. Prof. Carpenter has very kindly done so and informs me that specimens have antennæ of eleven joints. While this fact does not necessarily invalidate the status of *Rhachiocrema* it does place a different value on the other diagnostic characters.

Mann's description of *Rhachiocrema* appeared after the Myrmicine section of the *Genera Insectorum* (4) had gone to press. In the preface to that section Emery stated that it was limited to species described up to the end of 1918, but he made an exception in the case of *wheeleri*. This species was not listed in the usual way but referred to in a footnote on the "*paradoxa* group," a cluster of four species which Emery included in the subgenus *Orthocrema*. This footnote contained a peculiar anachronism. Although it correctly cited *wheeleri* as the type of *Rhachiocrema* and gave accurate reference to Mann's publi-

cation it further stated that Mann had elevated the "*paradoxa* group" into the subgenus *Rhachiocrema*. As has already been shown Mann made no such proposal, nor could he have done so for the description of *Rhachiocrema* was published two years before the "*paradoxa* group" first appeared in print. It is easy to dismiss Emery's mistake as a slip resulting from last minute alterations. It is not so easy to dismiss the consequences of the error. Regardless of what Emery believed and whether he intended to do so or not he originated the concept that all the members of his "*paradoxa* group" belong to the subgenus *Rhachiocrema*. There is clear proof that one eminent myrmecologist has accepted this view. When Menozzi published a key to the Malayan and Papuan species of *Orthocrema* in 1935 (5) he omitted the species in the "*paradoxa* group." The lack of dissident opinion in the literature indicates that the acceptance has been general. Yet the heterogeneity of the "*paradoxa* group" is evident from Emery's own work. During the course of his studies on New Guinea ants he described or redescribed each of the four species which he later built into the "*paradoxa* group." Three of them he figured as well. It is scarcely conceivable that Emery was unaware of their marked dissimilarities. These are even more evident when specimens are available for comparison. In the material sent from New Guinea by Mr. Levy were specimens of *paradoxa*, *polita* and *irritabilis* var. *le-guilloui*. The remaining species in the group, *emeryi*, was not represented. The structural contrast between *paradoxa* and the species *irritabilis* and *polita* is striking. For the purpose of this study only two characters will be considered. In *paradoxa* the antennal scapes project beyond the occipital margin by at least one-quarter of their length and the funiculus is provided with a distinct two-jointed club. The huge epinotal spines are more than half as long as the thorax. The base of each spine is stout and cylindrical and, although they arise at the angle between the basal and the declivous faces, their bases are so large that the angle itself is virtually obliterated. There is no infraspinal area in the usual sense of the term because the bases of the two spines involve the entire width of the thorax. In *irritabilis* the antennal scapes barely reach the occipital border; in *polita* they exceed it by an amount less than the greatest thickness of the scape. In both these species the funicular club is not distinctly two-jointed. The antepenultimate joint is enlarged so that, as Emery

noted, the club may just as well be considered three-jointed. The epinotal spines of *polita* are short, their length scarcely exceeding half the distance which separates their bases. The spines of *irritabilis* are about as long as the distance between their bases but by no stretch of the imagination can they be considered comparable to the colossal spines of *paradoxa*. As nearly as can be determined from Emery's description and figures of *emeryi* (6) (originally described by Emery as *biroi*, a preoccupied name which was later replaced by Forel) this insect is related to *irritabilis*. The epinotal spines are about the same length in the two species but they turn upward in *emeryi* and downward in *irritabilis*. A significant feature of Emery's figure of *emeryi* is the two-jointed funicular club. The length of the scape cannot be estimated since it was not figured and the description merely states that it is long. But even granting the unlikely supposition that the scape of *emeryi* is as long as that of *paradoxa* there is still no possibility of regarding the two insects as closely related.

From the above it seems clear that the only member of the "*paradoxa* group" which can be assigned to Rhachiocrema is *paradoxa* itself. The fact is rather too obvious, for the dissimilarity between *paradoxa* and the remaining species is so marked that it brings up a second problem. Since Emery was fully acquainted with the structure of *paradoxa* his inclusion of that species in the subgenus Orthocrema raises a question as to the validity of Rhachiocrema. Several of the subgeneric characters of Rhachiocrema are more clearly marked in *paradoxa* than in *wheeleri*. Hence if Orthocrema is sufficiently flexible to include *paradoxa* then *wheeleri* must also be included and there is no reason for the existence of Rhachiocrema. But it is by no means certain that Emery's treatment of Orthocrema can be justified. The form which Emery gave to his emended version of Orthocrema differed substantially from the original concept of the subgenus which Santschi presented in 1918 (7). Emery combined with Orthocrema the species which Santschi had placed in Neocrema as well as some of the species which Forel had allotted to Physocrema. Emery's reason for this arrangement is interesting and his statement on the matter is given in translation below:

"This subgenus (*i.e.*, Orthocrema) represents, in my opinion, the primitive stock, or at least that which comes nearest to the

primitive forms in the genus. Mr. Santschi in his recent study on the subgenera of *Crematogaster* has excluded from it certain species which show a furrow or a more or less marked impression on the postpetiole, on which he founds his subgenus *Neocrema*. This division which comprises neotropical and malagasy species does not seem homogeneous to me; this is why I have fused it with *Orthocrema*."

If *Neocrema* is heterogeneous neither it nor *Orthocrema* would become more homogeneous when fused. It is unlikely, therefore, that Emery's arrangement of *Orthocrema* was designed to secure structural uniformity. On the contrary he seems to have deliberately constructed a heterogeneous assemblage for the sake of having all the species which he considered primitive in the same subgenus. However desirable this may be from a phyletic standpoint it is not sound taxonomy to found a group on inconstant characters, which was what Emery did. He apparently regarded as primitive the rectangular petiole and the entire, globose postpetiole which many of the species in *Orthocrema* possess. But neither of these features holds for all the species which Emery included in *Orthocrema*. In the Australian species *frivola* the postpetiole is as clearly bilobed as in any species of *Acrocœlia* and the petiole is not markedly rectangular. The shape of the petiole of *paradoxa* is certainly very far from rectangular. Yet both these extreme conditions can be reached through species in which the conditions are intermediate so that from a phyletic viewpoint the assemblage can be defended. I believe that the phyletic gain which accrues to Emery's arrangement is more than offset by the taxonomic disabilities which it entails. In the form which Emery gave it the subgenus *Orthocrema* has to be characterized along such generous lines that no satisfactory delimitation of the group is possible. The recognition of *Neocrema* and *Rhachiocrema* as valid subgenera relieves *Orthocrema* of its most incongruous species and permits a much better demarkation of all three subgenera. That the three subgenera tend to intergrade is not a matter for concern for other subgenera of *Crematogaster* also possess integrating species.

I propose to treat *Rhachiocrema* as a valid subgenus even though the features which separate it are not as distinct as was originally supposed. Reference has already been made to the fact that antennal structure cannot be used as a basis for sepa-

ration. The same is true of the pedunculate petiole, for the new species described in this paper has a petiole that is closely similar to that of several species in the subgenus *Orthocrema*. The one remaining separatory character is the structure of the epinotal spines and, since spine length is such a notoriously variable characteristic, one hesitates to place much value on such a character. In *Rhachiocrema*, however, the spines show certain features that appear to exclude the possibility of confusion with long-spined species in other subgenera. In addition to their extreme length the spines of *Rhachiocrema* are not evenly tapered from base to tip. The taper of the thickened basal half of each spine differs from that of the thinner apical half. This break occurs suddenly at a point near the middle of the spine so that when the spine is viewed from the correct angle the two parts can be clearly distinguished. In other species of *Crematogaster* having long epinotal spines, as for example in the South American species *acuta*, the spines are evenly tapered from base to tip.

Key to the species of Rhachiocrema

1. Anterior peduncle of the petiole fully as long as the node itself, the node rounded above and without posterior angles; epinotal spines reflexed at the tip (New Guinea) *paradoxa*
Anterior peduncle of the petiole shorter than the node, the node flat above and with distinct posterior angles; epinotal spines straight at the tip 2
2. Entire insect shining and finely punctate; clypeus with five or six longitudinal ridges; color black (British Solomons) *wheeleri*
Head shining with sparse punctures, sides of the mesonotum and much of the epinotum densely and coarsely punctate and subopaque; clypeus bicarinate; color sordid yellow, the gaster castaneous, (Borneo) *macracantha*

Crematogaster (Rhachiocrema) macracantha sp. nov.

Worker: Length 3.5 mm.

Length of the head from the anterior edge of the clypeus to the occipital border 0.75 mm. The head is slightly longer than broad with the occipital angles broadly rounded and the middle of the occiput flat. The sides in front of the eyes are almost straight, converging gradually to the level of the antennal insertions but more sharply convergent and more curved from that point to the insertion of the mandibles. Eyes suboval, the lower edge much more flattened than the upper, moderately convex with about 10-11 facets in greatest diameter, the facets coarse. Clypeus moderately projecting with two prominent carinae.

There is often a delicate carinula lateral to each carina. The central lobe of the clypeus between the two carinæ is distinctly sulcate. Both the sulcus and the carinæ fail to extend entirely across the clypeus so that the posterior part of the clypeus forms an evenly convex bulge between the frontal lobes. The latter are narrow in front, scarcely covering the insertions of the antennæ, but broad and poorly defined behind so that the frontal area is not clearly marked. Antennæ eleven-jointed. Antennal scape long, slightly curved and rather thick at the tip. The scape exceeds the occipital margin by one-quarter of its length. Funicular joints all longer than broad, the first joint as long as the following three together, the last two joints forming a distinct club. Mandibles rather narrow and bearing four teeth, the two outer teeth longer than the inner two.

Overall length of the thorax including the neck 1 mm. Promesonotum seen from above pear-shaped, the promesonotal suture absent. The sides of the thorax at the mesoëpinal suture are strongly constricted above but less so on the lower portions of the meso- and metapleuræ. Epinotum diamond-shaped, about as wide as the pronotum with much of its upper face built into the expanded bases of the spines. The spines long, straight and widely divergent; the basal half of each spine stout, the apical half much thinner. The distance between their tips is 1.4 mm. Seen in profile the promesonotum is not strongly convex. In some specimens it descends through an even curve to the shallow mesoëpinal suture. In others there is a short, steep posterior face which breaks the even outline of the promesonotum. Basal face of the epinotum virtually flat between the base of the spines and the mesoëpinal suture. Declivous face largely involved with the base of the spines, the portion below the spines much shorter than the basal face. Anterior peduncle of the petiole distinct but only about one-quarter as long as the node, the latter somewhat longer than broad, broader behind than in front, with the sides feebly convex and narrowing to the shoulders which join the anterior peduncle. The posterior face of the node is straight and transverse, with a distinct angle where it joins the side. Posterior peduncle of the petiole almost as wide as the node itself and not quite as long as the anterior peduncle. Postpetiole seen from above transversely oval with distinct anterior and posterior peduncles. Seen in profile the petiole is wedge-shaped with a very feebly sinuate

lower surface and a small but distinct tooth under the anterior peduncle. The angles at the posterior face of the node stand out clearly above the posterior peduncle. Postpetiole in profile rounded above, the anterior peduncle sharply set off from the convex anterior face, the posterior peduncle forming an even concavity with the posterior face, the ventral surface flat with a constriction at the anterior peduncle. Gaster triangular, the anterior segment strongly rounded. Sting long.

Sculpture and pilosity: head smooth and shining with a few small, scattered punctures bearing long, rather coarse, erect yellow hairs. Mandibles feebly striate and with sparse, fine, short, subappressed hairs. Prothorax for the most part shining, the neck and the humeral angles coarsely punctato-striate and dull. A few coarse, erect hairs occur on the dorsum of the pronotum. Mesonotum, most of the epinotum and the sides of the petiole densely punctate, feebly shining to dull. Dorsum of the mesonotum and the anterior portion of the basal face of the epinotum with several longitudinal striæ in addition to the punctures. The punctures also occur on the basal half of the epinotal spines but are more feeble there than elsewhere. Declivous face of the epinotum, upper face of the petiole and most of the postpetiole smooth and shining. Epinotum without erect hairs, petiole and postpetiole each with two or more erect hairs. Gaster very delicately coriaceous, the sculpture not heavy enough to dull the shining surface. All gastric segments with moderately numerous erect, yellow hairs. Antennal scapes densely clothed with appressed hairs. Those on the funiculi equally numerous but not so closely appressed; the hairs on the funicular clubs very short, fine and erect. Hairs on the legs rather sparse, fine and closely appressed except for one or two long, erect hairs near the base of each femur.

Color: head, thorax and appendages sordid yellow, the gaster castaneous.

Type locality: Mt. Penrissen, Sarawak, Borneo.

Described from a series of thirty workers taken by E. Mjöberg and given to me many years ago by Dr. W. M. Wheeler.

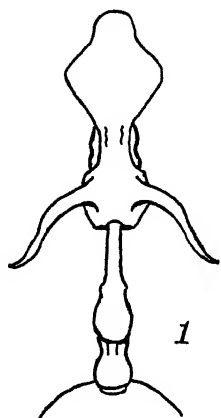
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EXPLANATION OF PLATE 12

FIGS. 1 and 2. *Crematogaster (Rhachiocrema) paradoxa* Emery. Fig. 3. *Cr. (Rhachiocrema) wheeleri* Mann after Mann. Figs. 4 and 5. *Cr. (Rhachiocrema) macracantha* n. sp.



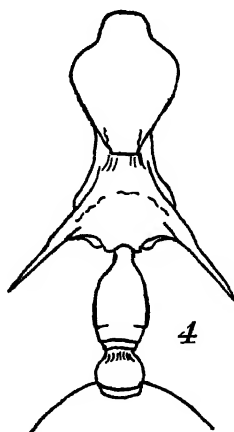
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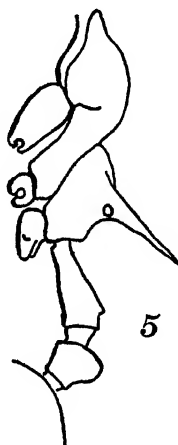
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TROPIDUCHIDÆ AND KINNARIDÆ FROM THE
GREATER ANTILLES ¹
(HOMOPTERA: FULGOROIDEA)

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The material on which this paper is based was collected a few years ago by Dr. P. J. Darlington in the hilly country of Hispaniola and Puerto Rico, and is deposited in the Museum of Comparative Zoölogy. The two groups discussed — the Neotropical Paricanine *Tropiduchidæ* and the *Kinnaridæ* — appear to have their maximum number of genera and species in the western Caribbean area and to be comparatively poorly represented in the Americas outside this region. Whether the Paricanini of the Old World form a natural group, and whether they are truly co-tribal with the Caribbean generic complex are problems which must wait for solution until the Asiatic species have been critically studied. For the time being the writer proposes to regard the tribe as extending to America, and lists the following characters as being common to the Neotropical genera that are assigned to it: vertex usually longer than wide, posterior margin deeply concave, disc depressed, ecarinate, or with median carina very prominent in the depressed area, or replaced by a vertical plate; frons much longer than wide (1.5 to 1 or longer) with a broad longitudinal median raised band, lateral margins sinuately expanding to near fronto-clypeal suture that incurved; head in profile usually with lateral margins curving evenly from vertex into frons; pronotum short, median carina prominent, disc not bounded by lateral carinæ, or if so bounded then narrow and strongly eminent; mesonotum short, flattened, scarcely half as wide as long; tegmina with a nodal and an apical line of transverse veins, apex of clavus situated near or basad of middle of commissural margin, subapical cells not exceeding six, apical rarely exceeding twelve; post-

¹ Published with the aid of a grant from the Museum of Comparative Zoölogy at Harvard College.

tibiæ trispinose. All the species known to the writer in this tribe are boldly marked on the frons, lateral fields of the pronotum, carinæ, etc., with black, orange, or red, or a combination of these colors, usually in vittæ.

The types of all species described as new are deposited in the Museum of Comparative Zoölogy. The writer's thanks are rendered to the Curator, Prof. N. Banks for permission to examine the collection and to him and to Prof. F. M. Carpenter for assistance in the preparation and publishing of this paper.

Family TROPIDUCHIDÆ
Subfamily Tambiniinæ
Tribe Paricanini

Achilorma Metcalf and Bruner

Metcalf and Bruner, 1930, *Psyche* 37:400

Vertex nearly twice as broad as long, anterior margin moderately convex, evenly rounded, posterior margin rectangularly excavate, lateral margins parallel, disc strongly depressed, anterior border of depression strongly convex, slightly extending before anterior margin of eyes, strongly carinate medially, frons longer than broad (about 1.3 to 1), lateral margins diverging and straight to just below level of antennæ, then incurved to fronto-clypeal suture, a broad longitudinal raised band medially with a shallowly impressed trough on each side; these medially-raised and medio-lateral impressed areas continuing on to clypeus; clypeus laterally carinate. Pronotum subequal in length at middle to vertex, disc strongly eminent, tricarinate, with a small round impression on each side of middle line, lateral carinæ of disc diverging posteriorly at 45° to medial carina, posterior margin obtusely angularly excavated in middle, curving cephalad near sides; mesonotum broader than long, tricarinate, lateral carinæ convex, disc about 1.5 times as long as wide (excluding scutellar apex). Hind tibiæ with three spines.

Tegmina about 3.2 times as long as broad, costal and commissural margins subparallel, apical margin symmetrically and almost semicircularly rounded; Sc+R and M not forked before nodal line, Cu1 forked a short distance before level of apex of clavus, M and Cu1a rather shorter than Sc+R; fourteen apical cells, six subapical; apex of clavus distad of middle of commis-

sural margin, area of membrane much less than that of corium (by approximately a third).

Genotype, *Achilius bicinctus* Spinola 1839, Ann. Soc. Ent. France, 8:321.

A. bicincta Spinola

Female. Length, 5.0 mm.; tegmen, 6.0 mm.

Pallid stramineous, possibly green in life, carinæ of head and thorax, a stripe at sides of abdomen and a suffusion on post-femora red, sometimes concolorous, the carinæ probably also piceous in some specimens; a spot on ventrolateral margin of pronotum on each side, a spot on pleurite immediately beneath the base of each tegmen piceous.

Tegmina ivory hyaline, a fuscous band from costa to anal angle just distad of basal cell, a fuscous band lying along nodal line on its distal side, and accordingly arcuately curved basad, veins of apical line of cross veins narrowly fuscous, a broad slightly paler fuscous border along apical margin, becoming paler at Cu and evanescent before apex of clavus; veins testaceous. Wings with apical lobe faintly suffused fuscous, R-M and M-Cu cross veins dark fuscous, veins otherwise testaceous, slightly tinged fuscous at apical margin.

Ovipositor with third valvulæ each bearing eight spines on margin.

Described from two females collected at Tonala, Chiapas, Mexico (July 31, 1909) in the collection of the A. M. N. H. They agree with Spinola's description and differ from his figures only in the slightly longer sunken disc of the vertex, the forking of Cu1 before the nodal line and in having one or two more apical veins. The shape of the tegmina is identical. Though this species should fall into the Tambiniinæ on the position of the nodal line, it undoubtedly belongs to the group of Neotropical Paricanine forms. *Achilorma fowleriana* Kirk. is not congeneric with *bicincta*.

Arenasella Schmidt

(figs. 17-19)

Vertex as long as broad, anterior margin strongly convex, lateral margins parallel, posterior margin deeply concave; most of disc of vertex much depressed, anterior margin of sunken area strongly convex almost subangularly so, reaching beyond

eyes for half their length; sunken area traversed by a strong median carina; anterior margin curving uninterruptedly on to frons; frons much longer than broad (1.5 to 1), lateral margins sinuately expanding to near apex, thence incurved to suture; median carina forming a distinct raised band; clypeus medially and laterally carinate. Pronotum in middle scarcely two-thirds as long as vertex, anterior margin of disc convex, heavily carinate; disc narrow, subtriangular, sides not strongly diverging posteriorly; median carina very thick; lateral carinae of disc less so, a pair of carinae on each side of pronotum near and at lateral margins; mesonotum about twice as wide as long, flattened, tricarinate, lateral carinae not converging posteriorly. Post-tibiae trispinose.

Tegmina with Sc+R+M stalk very short, Sc+R and M not forked before nodal line, Cu1 forked a short distance before nodal line; fourteen apical cells, six subapical; apex of clavus not reaching to middle of commissural margin, membrane distinctly larger than corium.

Genotype, *A. rubrovittata* Schmidt 1932 *Stett. Ent. Zeit.* 93:39.

Achilorma fowleriana Kirk. is placed in this genus. The type locality of *fowleriana* is given as Teapa in Tabasco, Mexico. Specimens examined by the writer came from Teapa, Mexico. Specimens examined by the writer came from Teapa, Mexico and Cerro Zunil, Guatemala. The small fork of Cu1 before the nodal line is variable.

Cyphoceratops Uhler

Uhler 1901, *Proc. Ent. Soc. Wash.* 4:510.

Genotype, *C. furcata* Uhler *loc. cit.* 511. .

This genus must be placed in the Paricanini as the structure of the frons, vertex, pro- and mesonotum and the tegminal venation are characteristic, though the apex of the clavus is distad of the middle of the commissural margin.

Parahydriena Muir

Muir, 1924, *Proc. Haw. Ent. Soc.* 3:464.

Genotype, *P. hyalina* Muir *ibid.*

Vertex twice as long as broad, lateral margins parallel, anterior margin convex, posterior margin deeply excavated, middle of vertex produced dorsally in a vertical triangular plate

with its anterior twin borders convex and posterior border straight or slightly concave; anterior margin with a median groove; frons longer than wide (2.3 to 1), lateral margins sinuately expanding to near apex, then incurved, carinate; median carina in form of a raised band terminating basally against cephalic horn, from which it is separated by a slight groove; clypeus one-third length of frons with a strong median carina, lateral margins carinate. Pronotum short, sloping anteriorly, median carina distinct, lateral carinæ of disc absent, lateral margins carinate between eye and tegula. Mesonotum tricarinate, lateral carinæ meeting medial carina near its anterior end. Hind tibiæ with three spines before apex.

Tegmina devoid of costal area, M leaving Sc+R near base, Sc+R and M not forked before nodal line, Cu forked just distad of middle of corium; a single subapical line of cross veins in membrane, forming six subapical cells and fourteen apical.

P. hyalina Muir
(figs. 14, 15, 27, 31)

Female. Length, 6.0 mm.; tegmen, 6.5 mm.

Green; margins and carinæ of front and vertex, sides of cephalic horn and head above eyes, a stripe on each lateral field of pronotum, a transverse stripe at apex of femora, two spots on mesothoracic pleurites piceous, often bordered red; a spot on metapleurites, postcoxæ, a suffusion on legs, patches on pronotum and mesonotum, abdominal tergites and lateral fields of abdominal ventrites greenish fuscous.

Ovipositor with eight teeth on third valvulæ.

Described from a single female taken between 1,000 and 2,000 ft., San José de las Matas, Dominican Republic, by P. J. Darlington (June, 1938). This specimen has a higher cephalic crest than that of the Puerto Rican type.

Family KINNARIDÆ
Subfamily Kinnarinæ

Southia Kirkaldy

Kirkaldy, 1904, Ent. 37:279.

Genotype, *Delphax opposita* F. 1803, Syst. Rhyng.:84.

Head with eyes scarcely more than half width of pronotum. Vertex very narrow, anterior margin very short, curving into

frons; lateral margins concave, diverging basally, raised; posterior margin rectangularly excavated, a transverse carina before level of anterior margin of eyes, disc deeply depressed; frons narrow, four times as long as wide at widest part, lateral margins much raised, gradually diverging to level of median ocellus, thence gradually curving inward to suture, median carina absent, median ocellus distinct; frons curving at base uninterruptedly into vertex; clypeus narrow with a strong median carina, lateral margins carinate; genæ slightly tumid below antennæ; antennæ with basal joint conspicuous, one third length of second joint, second joint cylindrical. Pronotum with anterior margin concave behind eyes, acutely produced at middle, posterior margin shallowly angularly emarginate, median carina prominent, lateral carinæ of disc absent, lateral margins distinctly carinate between eye and tegula. Mesonotum feebly convex, posteriorly flattened, not depressed, tricarinate, tip of scutellum pointed. Legs slender, hind tibiæ unarmed. Abdomen with wax-bearing plates very prominent on segments 6, 7 and 8.

Tegmina with Sc+R+M stalk as long as basal cell, Sc+R forking near stigma. Nine apical cells, four subapical.

Southia iridescens n.sp.

(figs. 11-13, 33)

Female. Length, 3.1 mm.; tegmen, 5.5 mm.

Vertex, frons, except on lateral margins, genæ, pro- and meso-coxæ and postfemora, and abdomen fuscous; mesonotum fuscous with a dark green iridescence; clypeus, lateral margins of frons, and pronotum testaceous; rostrum, legs, except pro- and meso-coxæ and postfemora, basal joint of antennæ, anterior and posterior margins of pronotum, and tegulæ stramineous; second joint of antennæ reddish brown; membrane of abdomen pallid.

Tegmina hyaline, ivory-yellow, a small dark spot at stigma bordered with pale, a minute fuscous spot beyond apex of clavus, apex of M faintly smoky; veins testaceous. Wings hyaline, veins fuscous.

Ovipositor with third valvulæ bluntly triangular, thickened.

Described from one female collected on El Tucuche, Trinidad, B. W. I. by P. J. Darlington (April, 1929). The genus

Southia differs from *Paroecleidius* Myers (type, *P. luizi* Myers, seen) in the shape of the vertex, in the length of the first segment of the antenna and in the number of subapical cells; from *Oecleidius* Van Duzee in the lower lateral carinæ of the frons, in the more prominent median carina on the clypeus, and in the less slender legs, as well as in the characters mentioned previously. In superficial appearance this insect is like *Oecleidius fulgidus* Van Duzee (type seen) though it lacks the pallid scutellar apex.

Subfamily Prosotropinæ

Quilessa Fennah

Fennah, 1942, Proc. Ent. Soc. Wash., 44, 5:103.

Genotype, *Q. lutea* Fenn. loc. cit. 104.

Quilessa tristis sp. nov.

(figs. 1, 20, 38, 39)

Female. Length, 2.1 mm.; tegmen, 2.7 mm.

Piceous; rostrum, fore and middle legs and hind tarsi pale testaceous, antennal collar and apical margin of first antennal joint narrowly pallid, postfemora fuscous, posttibiæ suffused fuscous, pale at apex, membrane of abdomen red.

Tegmina hyaline, heavily suffused smoky-brown on basal third, between posterior claval vein and commissural margin, in distal part of costal cell, in a broad band around apical margin extending inward as far as subapical cells, and slightly at Cu, in the posterior subapical cell; veins piceous, wings hyaline, faintly clouded fuscous distally, veins dark.

Pregenital plate large, quadrate, slightly broader than long, in ventral view with lateral margins slightly diverging distally; posterior margin shallowly concave, interrupted in middle by an almost semicircular plate directed caudad.

Ventral (3rd) valvulæ of ovipositor broad, expanding distally, apical margin oblique, minutely crenulate; dorsal (1st) valvulæ with more sclerotized portion sinuately tapering to a bluntly rounded apex, a large semilunate translucent lobe pendent from its lower border.

Described from a single female taken in Maricao forest, 2,000–3,000 ft., Puerto Rico, by P. J. Darlington (May 30–June 2, 1938). This species differs from others of the genus in the shape of the pregenital plate and in the tegminal coloration.

Quilessa fasciata sp. nov.
(figs. 2, 28, 35, 36)

Female. Length, 1.8 mm.; tegmen, 2.0 mm.

Lateral carinae very feebly present on margins of disc of pronotum.

Vertex and frons fuscous, frons rather paler; median carina throughout and lateral margins at base of vertex pale testaceous, genae fuscous below antennae, antennae fuscous; pronotum fuscous, median carina, lateral carinate margins, posterior and ventro-lateral borders pale; mesonotum fuscous, scutellum pale; tegulae fuscous, pale along inner posterior margin; sternum pale, lightly suffused fuscous; legs pallid yellow; abdomen fuscous, membrane red.

Tegmina yellowish, hyaline, clouded brown near base, and with a broad band of brown from middle of costa to commissural margin just basad of claval apex; veins pale distad of nodal line. Wings hyaline, veins testaceous, distally pallid.

Pregenital plate large, almost square, anterior margin shallowly convex, lateral margins in ventral view parallel, posterior margin transverse.

Third valvulae of ovipositor moderately narrow, tapering distally; dorsal margin straight, ventral margin convex: first valvulae narrower, porrect, tapering distally to a blunt point, dorsal margin slightly convex, ventral margin straight.

Described from two females taken in Maricao forest, 2,000–3,000 ft., Puerto Rico, by P. J. Darlington (May 30–June 2, 1938). This species is distinguished by the shape of the pregenital plate and the tegminal coloration.

Quilessa pellucida sp. nov.
(figs. 3, 21, 40, 41)

Male. Length, 1.7 mm.; tegmen, 2.0 mm.

Piceous, legs fuscous near joints, membrane of abdomen red.

Tegmina hyaline, lightly suffused brown on basal fifth, veins and margin testaceous to fuscous. Wings hyaline, veins testaceous.

Anal segment with lateral lobes prominent, produced distally. Perianthium thin, scoop-like, incompletely divided into two unequal lobes by a deep notch passing medio-ventrally from apex; lobe of left side very broad, ventral margin in profile

strongly convex, dorsal margin straight, turning upward near apex; lobe of right side much narrower, curving dorsally and tapering evenly to an acute point. Penis with a long sinuate spinose process arising one-third from base on left side directed dorsally and caudad, apical portion of penis lobate, in profile with dorsal margin shallowly convex, apical margin oblique, minutely denticulate, apical process a stout, curved spine directed dorsally and posteriorly.

Genital styles in profile expanding from base, ventral margin almost straight, curving distally into a narrow lobe, dorsal margin concave, rising steeply and curving mesally to meet vertical apical margin in a blunt point.

Described from a single male taken in Maricao forest, 2,000–3,000 ft., Puerto Rico, by P. J. Darlington (May 30–June 2, 1938). This species is distinguished by the genitalia and the tegminal coloration. It differs from all the lesser Antillean species in not having a lateral process projecting from the hind margin of the pygofer, a difference which may prove to be of generic value if other forms like *pellucida* are found with a generally similar ædeagal armature.

Quilessa funebris sp. nov.

(figs. 4, 30, 42, 43)

Female. Length, 1.7 mm.; tegmen, 2.1 mm.

Piceous; rostrum, legs excluding pro- and meso-coxæ testaceous, slightly suffused fuscous; membrane of abdomen red.

Tegmina smoky brown, a hyaline spot in middle of corium between M and Cu1 extending slightly beyond M towards R, a smaller hyaline spot at base of longest apical cell (M2), a pale line just distad of nodal line; first subapical and inner margin of posterior subapical cell almost hyaline; veins fuscous. Wings hyaline, very slightly tinged fuscous; veins fuscous.

Pregenital plate subquadrate, twice as broad as long, anterior margin straight, lateral margins in ventral view parallel, posterior margin rather strongly convex. Ovipositor with third valvulæ fairly broad, dorsal and ventral margins almost parallel, apical margin very oblique, first valvulæ about two and a half times as long as broad, bluntly rounded distally, dorsal and ventral margins weakly convex.

Described from a single female taken on El Yunque, Puerto

Rico, at about 3,000 ft., by P. J. Darlington (May, 1938). This species is distinguished by the shape of the pregenital plate and of the valvulæ of the ovipositor, and by the coloration.

Atopocixius Muir

Muir 1926 Proc. Haw. Ent. Soc. VI, 2:335.

Genotype, *A. ornatus* Muir *loc. cit.* 336.

Head with eyes a little more than half width of pronotum. Vertex longer than wide expanding to base which is shallowly emarginate; median and lateral carinæ well developed, curving uninterruptedly on to frons; no transverse carina. Frons longer than its widest part (1.4 to 1), base scarcely half as wide as apex, sides expanding to nine-elevenths from base, then evenly converging to apex, median carina distinct, lateral margins slightly raised. Clypeus at base four-fifths as wide as widest part of frons, tapering acutely to apex, median carina distinct, lateral margins slightly raised. Frons in profile slightly convex sloping into vertex in a somewhat acutely angulate curve; clypeus almost flat; no median ocellus; genæ slightly tumid below antennæ; no subantennal process; antennæ with basal segment very short, second segment slightly longer than broad, eyes widely emarginate ventrally. Pronotum three-quarters as long as vertex, anterior margin of disc convex, posterior margin shallowly excavated, curving anteriorly at sides, median carina prominent, lateral carinæ of disc present, incurved anteriorly, lateral margins carinate between eye and tegula. Mesonotum feebly convex, tricarinate, hind portion only slightly depressed, tip of scutellum acute. Hind tibiæ unarmed. Tegmina with sides expanding distally for three-quarters of length, almost symmetrically rounded at apex; clavus not granulate; apex of clavus situated three-quarters from base of tegmen; costal cell wide, slightly expanding apically, Sc+R joined to near stigma, common stalk Sc+R+M half as long as basal cell; typically seven or eight apical cells, the first two (or three) with curved sides, followed by a smaller triangular cell; second cell of M long with lateral margins decurving distally; distal portion of M curving posteriorly; third cell of M curved, subtrapezoidal, first cubital triangular or even semilunate, posterior cell pentagonal; a subapical series of four cells, the anterior forming a quarter circle, second rectangular, third pentagonal, fourth quadrangu-

lar. Wings with four apical cell elongate-triangular with a very short basal stalk.

This genus is near *Quilessa*, but differs in the shape of the vertex and of the frons, in the presence of a distinct pronotal disc bounded by carinæ, in the pronounced curvature of the veining at the apex in the tegmina, in the relatively more elongated and shorter-stalked fourth apical cell in the wings, in the wider lateral lobes of the male anal segment and in the basic form of the ædeagal armature. The four known species of this genus agree in possessing a small dark spot at the basal end of the stigma and a second dark spot in the third apical cell of M, but this character may not be of significance in identifying the genus.

Atopocixius collaris sp. nov.
(figs. 7, 26, 29, 44-46)

Male. Length, 1-8 mm.; tegmen, 2.0 mm.

Female. Length, 1-9 mm.; tegmen, 2.1 mm.

Scutellar portion of mesonotum scarcely depressed.

Vertex, frons, clypeus, anterior margin medially and lateral fields of pronotum, tegulæ, mesonotum except on lateral margins and scutellum, postfemora except at base and apex, and abdominal sclerites piceous; lateral margins of vertex at base, lateral margins of frons in apical half, genæ below antennæ, rostrum, upper surface of pronotum, tip of scutellum and legs whitish yellow; lateral margins of mesonotum orange brown; membrane of abdomen red.

Tegmina fuscous; distal half of costal cell except for an oblique fuscous band, middle portion of first subapical and apical cells from stigma as far as M2, a narrow spot overlying vein forming base of second apical cell of M, hyaline, the intervening veins heavily infuscate except at node; base of tegmen, scutellar margin and a small triangular spot at apex of clavus pallid yellow; a dark fuscous spot at base of stigma and another at base of third apical cell of M. Wings hyaline, veins fuscous.

Anal segment of male with lateral lobes broad produced beyond anal margin scarcely or not incurved distally. Ædeagus with a slender sclerotised rod in middle line dorsally, a sinuate distally bifurcate spinose process arising near middle of ventro-lateral margin on each side, directed obliquely backward and outward; a pair of vertical spinose processes at apex, slightly

curved anteriorly near tip. Genital styles in profile fairly narrow, dorsal margin convex basally, concave in middle, slightly convex distally, distal lateral process shallowly emarginate, distal and proximal protuberances of equal height; apex of each style curved posteriorly, lip-like.

Pregenital plate of female twice as wide as long, subquadrate; anterior and posterior margins transverse, lateral margins in ventral view distinctly convex.

Described from one male taken at Constanza, Dominican Republic, at 3,000-4,000 ft. (August, 1938) and one female from Mt. Diego de Ocampo, Dominican Republic, at the same altitude (July, 1938), both collected by P. J. Darlington. This species is distinguished by the shape of the genitalia, and by the body and tegminal coloration.

Atopocixius melanocephalus sp. nov.

(figs. 5, 10, 37, 49, 50)

Male. Length, 1.9 mm.; tegmen, 2.0 mm.

Piceous; rostrum, legs, and anterior portion of discal carinae of pronotum fuscous.

Tegmina hyaline, fuscous or brown in corium between Sc+R and commissural margin, costal cell infusate at base, traversed by a very oblique fuscous band in distal quarter; first subapical cell mostly hyaline and a hyaline area in each apical cell from stigma as far as M2 a clear spot overlying the cross vein at base of second apical cell of M; common vein of clavus pale just distad of junction, and a small pale area at apex of clavus; a small fuscous spot at base of stigma and another at base of third apical cell of M. Wings hyaline.

Anal segment of male with lateral lobes produced, broad, not incurved. Aedeagus almost straight, slightly tapering distally; perianthrium with a pair of minute teeth on each side ventrolaterally two-thirds from base; narrowing abruptly at apex and produced into a pair of long recurved thin processes, each of which gives off a short spine dorsally towards the apex, and at tip is laterally compressed into a flat lobe continued dorsally in a short horizontal spine directed anteriorly; penis with a pair of narrow sclerotised arms tapering distally, each bearing on its inner face dorsally a series of five short teeth directed mesally and posteriorly. Genital styles in profile fairly narrow, dorsal margin slightly convex at base, strongly concave distally, dorso-

lateral process of each side slightly notched, distal lobe very much larger than proximal; ventral margin convex, apical margin deflexed, in profile minutely excavated.

Described from a single male taken at 1,000–2,000 ft., San José de las Matas, Dominican Republic (June, 1938), by P. J. Darlington. This species is distinguished by the shape of the male genitalia and by the coloration.

Atopocixius major sp. nov.
(figs. 6, 22, 25, 34, 47, 48)

Male. Length, 2.0 mm.; tegmen, 2.5 mm.

Female. Length, 2.2 mm.; tegmen, 2.7 mm.

Frons, except on lateral margins distally, clypeus, sides of head before eyes, lateral fields of pronotum, mesonotum, except on margins and scutellum, tegulæ, pro- and meso-coxæ, basal two-thirds of postfemora, and abdomen piceous; vertex, lateral margins of frons distally, genæ, rostrum, upper surface of pronotum, mesothoracic pleurites below tegulæ, tip of scutellum and legs, except basal part of postfemora, sulphur yellow; margins of mesonotum reddish brown; membrane of abdomen red.

Tegmina fuscous; a spot covering apex of costal and base of first subapical cells, middle and distal areas of apical cells from stigma to M2, a small spot overlying M cross vein in membrane, and a small area at apex of clavus hyaline; a spot at base of stigma and another at base of third apical cell of M dark fuscous; base of tegmen and scutellar margin pallid yellow; veins fuscous. Wings hyaline, slightly smoky at base, veins fuscous.

Anal segment of male short, lateral lobes broad, produced distally, not incurved. Ædeagus with periandrium tapering distally, somewhat oblique and expanded near apex, the two sides together assuming a shallow scoop-like form; dorsal margin of each side at apex with three or four minute teeth and a short almost horizontal apical spine. Penis slightly curved, ventral margin weakly convex, dorsal margin sinuate, subparallel to near apex, then abruptly decurved to meet ventral margin in a short spine directed posteriorly and outward, continuing outward curvature of each lateral arm of penis. Genital styles in profile rather narrow, dorsal margin slightly convex at base, thence strongly concave, dorso-lateral apical process deeply excavated, distal protuberance narrowly lobate, much

longer than proximal; ventral margin convex, apical margin deflexed, lip-like.

Pregenital plate of female twice as wide as long, subquadrate, anterior and posterior margins parallel, lateral margins in ventral view slightly convex.

Described from one male and one female taken between 3,000 and 7,000 ft. in Valle Nuevo, S. E. Constanza, Dominican Republic, by P. J. Darlington (August, 1938). This species is distinguished by its size, by the shape of the male genitalia, and by the coloration.

Lomagenes gen. nov.

Head with eyes scarcely two-thirds width of pronotum. Vertex as long as wide, lateral margins expanding to base, which is shallowly emarginate; anteriorly a broad transverse ill-defined ridge or obsolete carina separating vertex from frons; about midway between this and base a prominent transverse carina, angulate at middle with apex cephalad, with a median carina passing forward from it to curve on to frons; vertex basad of this angulate carina depressed, the depressed part being two and a half times as wide as long. Frons longer than its widest part (1.4 to 1), base slightly more than half as wide as apex, lateral margins sinuately expanding to three-quarters from base then curving inward to suture; median carina distinct, lateral margins carinate, slightly raised. Clypeus at base three-quarters as wide as widest part of frons, tapering acutely to apex; median carina absent, lateral margins carinate; clypeus and apical half of frons only slightly convex in profile, suture impressed, frons at base subangularly rounded into vertex; no median ocellus, genæ rather tumid below antennæ; no subantennal process; antennæ with basal segment very short, second segment slightly longer than broad; eyes widely emarginate ventrally. Pronotum as long as vertex, anterior margin medially convex, shallowly emarginate behind eyes, posterior border shallowly emarginate, curving anteriorly at sides; median carina distinct, lateral carinae of disc obsolete or absent, lateral margins strongly carinate between eyes and tegulæ; mesonotum feebly convex, distinctly tricarinate, scutellar area depressed, tip of scutellum acute. Hind tibiæ unarmed.

Tegmina with sides expanding apically for two-thirds of

length, almost symmetrically rounded at tip; clavus not granulate. Costal cell wide, slightly expanding apically, Sc+R joined to near stigma, common stalk Sc+R+M half as long as basal cell. Typically eight apical cells, the anterior trapezoidal, second quadrilateral with straight sides, third small, triangular, fourth elongate, rectangular, fifth triangular, sixth elongate, wedge-shaped, seventh triangular, eighth pentagonal; a sub-apical series of three cells, the first forming a quarter circle, second subrectangular and third quadrilateral; clavus joining commissural margin about two-thirds from base of tegmen. Genotype, *Lomagenes delphacoides* sp. nov.

This genus is near *Quilessa* but differs in possessing no median carina on the clypeus and an angulate carina on the vertex with a sunken area behind it.

Lomagenes delphacoides sp. nov.

(figs. 8, 9, 23, 24, 32)

Female. Length 2.0 mm.; tegmen, 2.7 mm.

Vertex, except carinæ, base of frons, upper surface of pronotum except anterior margin, fuscous; carinæ of vertex, basal half of frons, clypeus, thoracic pleurites, anterior margin of pronotum, margins of mesonotum, tegulæ, reddish-brown; apical portion of frons, genæ below antennæ, legs, valvulæ of ovipositor, testaceous; mesonotum and scutellum fuscous-piceous with a faint greenish iridescence; abdomen piceous.

Tegmina hyaline, slightly suffused yellowish-brown on clavus in basal third and apical quarter; veins and margin testaceous-fuscous. Wings hyaline, veins fuscous.

Pregenital plate quadrate, slightly more than twice as broad as long, anterior margin transverse, minutely crenulate, lateral margins in ventral view slightly diverging posteriorly, feebly convex, posterior margin transverse or very shallowly concave. Third valvulæ of ovipositor broad, tapering distally to a blunt point, dorsal margin almost straight, ventro-apical margin oblique. First valvulæ narrow, bluntly rounded distally.

Described from one female taken at about 6,000 ft. at Loma Vieja, S. Constanza, Dominican Republic, by P. J. Darlington (August, 1938).

Dineparmene gen. nov.
(fig. 16)

Vertex a little longer than wide, lateral margins diverging basally, posterior margin very shallowly excavate, anterior margin transverse curving uninterruptedly into frons; lateral margins carinate, median carina distinct to base and passing anteriorly into median carina of frons, no transverse carina; frons longer than broad (1.4 to 1), lateral margins expanding distally not narrowing to suture, or scarcely so; greatest width of frons below level of antennæ; width at base slightly more than half width at apex; median carina present throughout, no median ocellus; clypeus at base scarcely as wide as widest part of frons, flattened, weakly carinate medially, lateral margins carinate; vertex and basal half of frons forming in profile an even curve, apical half of frons feebly convex, suture impressed; genæ somewhat tumid; antennæ with basal segment very short, ring-like, second segment slightly longer than broad. Pronotum as long as vertex, posterior border shallowly excavated, sloping obliquely anteriorly near sides; median carina distinct, no lateral carinæ on disc, lateral margins carinate between eye and tegula; mesonotum convex, strongly tricarinate, scutellar area much depressed; posttibiæ unarmed. Abdomen with wax-bearing plates rather prominent.

Tegmina with sides subparallel; Sc+R forking near stigma, a short Sc+R+M stem basally, nine cells on apical margin. Wings with fourth apical cell about three times as long as its basal stalk.

Genotype, *Eparmene cubana* Myers 1928, Studies on Cuban Insects: 20.

This genus has the wax-bearing surfaces of the abdomen developed to a larger size than seems to be usual in Prosotropinæ. It differs from *Eparmene* Fowler in having the frons reaching its greatest width below the level of the antennæ, the maximum width in *Eparmene* being reached at the upper level of the antennæ; in having the basal joint of the antennæ very short, this being unusually long in *Eparmene*, and in not having a tricarinate pronotum. The description has been drawn up from the monotype with the original description at hand. It is worth recording that the waxy secretion of *D. cubana* is unusual in taking the form of curved thick parallel rods, which are translucent and opalescent.

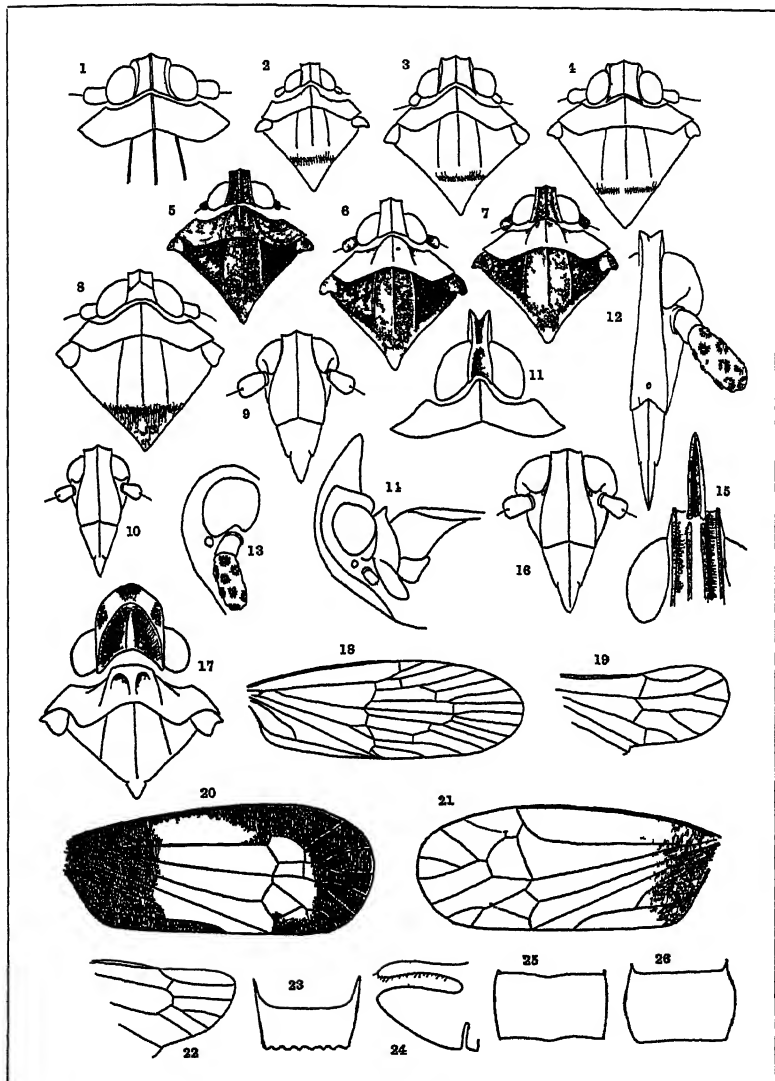
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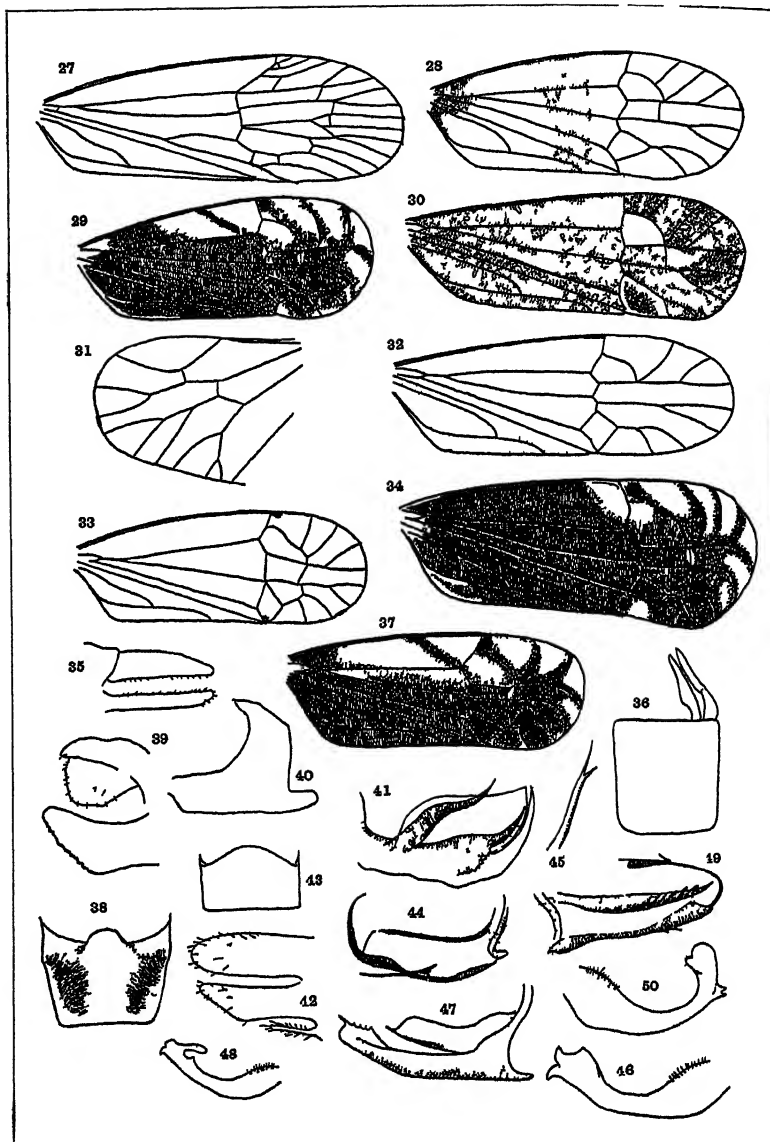
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EXPLANATION OF PLATES

1. *Quilessa tristis* Fenn. Head and prothorax, dorsal view.
2. *Q. fasciata* Fenn. Head and thorax.
3. *Q. pellucida* Fenn. Do.
4. *Q. funebris* Fenn. Do.
5. *Atopocixius melanocephalus* Fenn. Do.
6. *A. major* Fenn. Do.
7. *A. collaris* Fenn. Do.
8. *Lomagenes delphacoides* Fenn. Do.
9. *L. delphacoides* Fenn. Head, facial view.
10. *Atopocixius melanocephalus* Fenn. Do.
11. *Southia iridescens* Fenn. Head and prothorax, dorsal view.
12. *S. iridescens* Fenn. Head, facial view. (Right side omitted.)
13. *S. iridescens* Fenn. Vertex and basal part of frons in profile.
14. *Parahydriena hyalina* Muir. Head and pronotum, side view.
15. *P. hyalina* Muir. Base of frons and process of vertex, anterior view.
16. *Dineparmene cubana* Myers. Head, facial view.
17. *Arenasella fowleriana* Kirk. Head and thorax, dorsal view.
18. *A. fowleriana* Kirk. Tegmen.
19. *A. fowleriana* Kirk. Apical portion of wing.

20. *Quilessa tristis* Fenn. Tegmen.
21. *Q. pellucida* Fenn. Tegmen.
22. *Atopocixius major* Fenn. Apical portion of wing.
23. *Lomagenes delphacoides* Fenn. Pregenital plate of female, ventral view.
24. *L. delphacoides* Fenn. Valvulæ of right side of ovipositor, lateral view.
25. *Atopocixius major* Fenn. Pregenital plate of female, ventral view.
26. *Atopocixius collaris* Fenn. Do.
27. *Parahydriena hyalina* Muir. Tegmen.
28. *Quilessa fasciata* Fenn. Do.
29. *Atopocixius collaris* Fenn. Do.
30. *Quilessa funebris* Fenn. Do.
31. *Parahydriena hyalina* Muir. Apical portion of wing.
32. *Lomagenes delphacoides* Fenn. Tegmen.
33. *Southia iridescens* Fenn. Do.
34. *Atopocixius major* Fenn. Do.
35. *Quilessa fasciata* Fenn. Valvulæ of ovipositor, left side, lateral view (figured upside down).
36. *Q. fasciata* Fenn. Pregenital plate of female and valvulæ of right side, ventral view.
37. *Atopocixius melanocephalus* Fenn. Tegmen.
38. *Quilessa tristis* Fenn. Pregenital plate of female, ventral view.
39. *Q. tristis* Fenn. Valvulæ of ovipositor, right side, lateral view.
40. *Q. pellucida* Fenn. Left genital style, lateral view.
41. *Q. pellucida* Fenn. Ædeagus, left side, lateral view.
42. *Q. funebris* Fenn. Valvulæ of ovipositor, right side, lateral view.
43. *Q. funebris* Fenn. Pregenital plate of female, ventral view.
44. *Atopocixius collaris* Fenn. Ædeagus, right side, lateral view.
45. *A. collaris* Fenn. Ædeagal spine of right side, dorsal view.
46. *A. collaris* Fenn. Right genital style, lateral view.
47. *A. major* Fenn. Ædeagus, right side, lateral view.
48. *A. major* Fenn. Right genital style, lateral view.
49. *A. melanocephalus* Fenn. Ædeagus, left side, lateral view.
50. *A. melanocephalus* Fenn. Left genital style, lateral view.





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A REVIEW OF THE CHRYSOPIDÆ (*NOTHOCHRYSIDÆ*) OF CENTRAL AMERICA¹

BY NATHAN BANKS

Museum of Comparative Zoölogy

Many years ago the writer described a few species from Central America, including Baja California. Since then Navas has published a large number of species. For some years the author has had a manuscript synopsis of the species in the Museum. In 1937 Professor Roger Smith visited the various European museums to study the types of Chrysopidæ; he has given me a copy of these notes. With this most useful help I have felt emboldened to present tables to the species known to me, with descriptions of some new forms.

Besides the specimens at the Museum of Comparative Zoölogy I have seen those belonging to the American Museum of Natural History, the Academy of Natural Sciences of Philadelphia, and the U. S. National Museum.

As to classification, I have made an attempt to get away from dependence upon the divisory veinlet.

In the Central American forms I see, outside of the Apochrysinæ, three groups, one those represented by *Nadiva* and allies, in which the joints of the antennæ are very broad, the thorax broad, the venation more or less irregular, particularly in the discoidal cell; the anal area of the hind wings is large and the branches of anal veins sometimes forked. The second group is that based on *Chrysopa* and allies in which the stigmal area is unmarked, and the medius of fore wing slopes down evenly to its marginal fork. This genus should be divided. The third group is that of *Nodita* and *Leucochrysa*, in which there is a dark mark at the base of stigma, and the medius curves to

¹ Published with the aid of a grant from the Museum of Comparative Zoölogy at Harvard College

join the outer gradates; if not curving it is at least bent somewhat before forking. If one has assorted many specimens of *Nodita* and *Leucochrysa* he will find specimens that arouse doubt. Specimens put in *Nodita* sometimes have the divisory vein ending at the upper end of cell, and Navas has described one (*notha*) with the divisory vein ending as in *Leucochrysa*. A specimen that has the divisory cell as typical of *Leucochrysa* as in *L. varia* was the last straw. For in other structures and in coloration it agrees closely with the large species of *Nodita*, *azvedoi*, *maronica*, *egregria*, etc., having the radial sector much curved, partly black, the costal area rather narrow, the marginal forks wholly brown, and in the hind wing the marginal vein on hind margin is brown.

I am convinced that the difference between *Nodita* and *Leucochrysa* does not reside in the divisory cell, but in the course of the radial sector.

In *Nodita* the costal area at broadest is rarely equal to the radial area (at broadest), and the radial sector at widest part of the radial area is at least as near to medius as to the radius.

In *Leucochrysa* the costal area at broadest is about equal to or broader than the radial area (at broadest), and the radial sector at broadest part of radial area is plainly nearer to radius than to the medius.

Between *Nodita* and *Chrysopa* I have depended chiefly on the dark mark in stigma for *Nodita*. Many species of *Nodita*, on drying, tend to have the pronotum collapsed transversely, a deep groove along the middle; the transverse groove being close to the hind margin; some *Nodita*, however, show the transverse groove near middle of length.

Those species of *Nodita* and of *Leucochrysa* perhaps in which the medius does not so plainly curve to join the outer gradates might go into another genus; but I would prefer to find for it some other character. The width of the costal stigmal area in the true *Leucochrysa*s is usually more than those that would be split off by this division; but the width grades so much it is not dependable. It might even be suggested to unite the large and typical *Leucochrysa* with the large *Nodita* into one genus, there is much in common, but the comparative widths of the costal and radial areas appear to keep them apart.

The genera are much the same as those of northern South America, and in several cases the species; in northern Mexico

there are several species which occur in the southern part of the United States.

I have listed as "species" all forms that I could distinguish fairly definitely by color as well as by structure. The markings of the head and thorax and sometimes of abdomen are generally constant. There is always some variation, but it is often in extent or distinctness of development, rather than presence or absence. Specimens sometimes become discolored, and then it is difficult to determine face-marks. The study of male genitalia in this group will serve better to differentiate the species, but tends to neglect other structures which may be of value in defining subspecies, varieties, and races, which will surely follow more extensive studies. Taxonomy is not simply to show how species can be separated, but just as truly to show how they can be allied, — classified. Although the genitalia in many groups are the most valuable in distinguishing forms, one should remember that in Nature no species is kept separate by the structure of its genitalia.

The name *Chrysopa* is a pure synonym of *Hemerobius*, and no scrapping of rules can change that fact. But until *Chrysopa* can be split into a number of genera (only one small one will have to take the name *Hemerobius*) I shall utilize the old name. Rambur a hundred years ago provided a name for the *Hemerobius* of McLachlan and Hagen.

Key to Genera

1. Third cubital cell not divided; costal area very broad; no regular series of gradates; five or six branches of radius beyond subcosta; radials often connected by cross-veins. *Apochrysinæ*

Third cubital cell divided in some way; costal area much narrowed at stigmal area; rarely more than three branches to radius beyond subcosta; cross-veins in middle area mostly in two or three series *Chrysopinæ* 2

2. Antennæ on basal half, at least, with the joints plainly broader than long;

a — Thorax moderately slender; antennæ with basal joints rather widely separated, and slender; in male with a process between antennæ *Meleoma*

b — Thorax broad, basal joints of antennæ stout and little separated, no process between them; in hind wing branches of anal often forked *Nadiva*

Joints of the antennæ, except a few toward base, are plainly longer than broad, pronotum often more slender, and in hind wings the anal branches not forked 3

3. Medius of fore wing slopes down to its marginal fork, scarcely, if at all, bent; no dark spot at base of the stigma; antennæ but little longer than wings 4

Medius before marginal fork usually curves up a little to run into the outer gradate series; if it does not it is at least bent at that place; nearly always a dark spot at the base of the stigma; antennæ often very long; divisory vein often oblique and straight 8

4. Divisory vein ends on the end of third cubital cell and about parallel to both medius and cubitus . . . *Chrysopodes*

Divisory vein ends on the medius, before end of the cell, and is often curved 5

5. Inner series of gradates absent in either hind or both pairs of wings; radius usually has three or more branches to the margin beyond end of subcosta; small species with few cells and the cubital area broad 6

Inner series present with at least one gradate in both wings 7

6. Wing veins and much of body greenish; no inner gradates in either wing *Chrysopiella*

Wing veins and much of body brownish; inner gradates usually present in fore wing *Eremochrysa*

7. In male a process between the antennæ, in female the basal joints of antennæ more widely separate than in *Chrysopa* *Meleoma*

No process between the antennæ, which are rather close to each other at base *Chrysopa*

8. Divisory vein parallel to each side of the third cubital cell; a series of cross-veins connecting some of the radials *Carcarulla*

Divisory vein oblique 9

9. A cross-vein before radial sector, usually but five cubital cross-veins beyond the divisory cell *Berkmansus*

No cross-vein before radial sector; usually six or more cubitals beyond divisory cell 10

10. With a more or less complete third gradate series between the other two *Neula*

No intermediate gradate series 11

11. Some costal cross-veins above origin of radial sector strongly sinuous; divisory cell more or less of a V; costal area wider than radial; costal stigmal area four times as broad as the subcostal stigmal area *Vieira*

No such sinuous costals, costal stigmal area usually less broad 12

12. Radial sector more strongly curved, so that the widest part of the radial area is nearer to the medius than to the radius; costal area usually rather narrow and not as broad as radial area; divisory vein usually ends on the medius plainly before end of cell *Nodita*

Radial sector less curved so that at the widest part of the radial area it is as near or nearer to radius than to medius; costal area usually broader than radial area; divisory vein usually ends on the end of the cell 13

13. Stigma with a large black spot extending back to the radial sector; costal stigmal area usually twice as broad as the subcostal stigmal area *Gonzaga*

Stigmal mark much smaller; costal stigmal area rarely twice as broad as the subcostal stigmal area *Leucochrysa*

Two genera recorded from this region by Navas I have not been able to recognize in the material studied.

Ancylochrysa 1928 from Costa Rica from the odd divisory vein it might be near Goliva; but he says nothing about short antennal joints, the radial sector is little curved and the costal area broad as in *Leucochrysa*; the radius has several branches to margin beyond end of the subcosta; the medius slopes evenly to its marginal fork.

Orlandsia 1914a from Chiriqui has the divisory vein as in *Nodita*, otherwise it is (according to figure) much like *Ancylochrysa*, the costal area being broad, the radial sector little curved, the medius running to its marginal fork without a bend, no mark in stigma, and the costal part of stigma much broader than the subcostal; both have a very broad post cubital area.

APOCHRYSINÆ

Four forms are known from Central America.

Lainius constellatus Navas 1913, from Guatemala.

Domechus sigillatus Navas 1913, from Guatemala.

Kimmins 1940 states this is the *Apochrysa mirifica* Gerst.

Loyola croesus Gerst. 1893, from Chiriqui.

Loyola mirifica Gerst. 1888, from Chiriqui.

Kimmins 1940 puts this in *Domenechus*.

CHRYSOPINÆ

Table to Species of *Chrysopa*

1. Face with dark marks as in *Ch. oculata*, second joint of antennæ dark, beyond pale *mexicanus*
 No such marks 2
2. Antennæ beyond second joint black, at least for a short distance 25
 Antennæ beyond second joint wholly pale 3
3. Basal joint of antennæ with dark spot or stripe . . . 4
 Basal joint unmarked 12
4. Basal joint with two dark stripes, gradates parallel and near together *arioles*
 Basal joint with but one dark stripe 5
5. A good-sized black spot each side on pronotum . *discolor*
 No such spots 6
6. Palpi dark 7
 Palpi pale 10
7. Inner gradates bowed up toward radial sector; branches of radial sector much bent by inner gradates . . . *annotaria*
 Inner gradates parallel to outer row; branches of radial sector scarcely bent by inner gradates 8
8. Head, face, vertex, and basal antennal joint suffused with reddish; practically all cross-veins dark; about five inner gradates *dampfina*
 Head not suffused with reddish; inner gradates often but three; third cubital cell much narrowed at base, and often but one branch to hind margin, two from fourth cell 9
9. Abdomen pale as the thorax; pronotum narrowed from base to the front *valida*
 Abdomen darker than thorax; pronotum not narrowed, except near front *tolteca*
10. Reddish mark on cheeks, face broadly reddish; vertex red each side; gradates not parallel; pronotum with two red spots on each side before margin *batesi*
 No reddish or other mark on cheeks 11

11. Inner gradates not reduced, both series more or less plainly bordered, and not parallel *infausta*

Inner gradates often reduced about half. close to and nearly parallel to outer row, not bordered; radials dark only in middle *caligata*

12. Venation almost wholly pale greenish, gradates not dark; divisory cell usually ends before the cross-vein above . . 13

Venation with some cross-veins at least partly dark and the gradates dark 14

13. Cubital area more than one half as wide as the post cubital; reddish on cheeks usually extends upward by side of eye, no black streak *comanche*

Cubital area not quite one half as wide as the post cubital area; a black streak by side of the red on cheek . . *californica*

14. Seven cubital cross-veins beyond the divisory cell; a dark spot on each cheek and one each side on clypeus; venation largely green *facialis*

Six cubitals beyond divisory cell 15

15. Some veins behind radial sector bordered with yellowish, the gradates bordered with brown; no mark on cheeks; palpi pale *parishi*

No veins bordered with yellowish 16

16. Palpi dark or lined; inner gradates arise before or very near the penultimate cubital cross-vein 19

Palpi pale; inner gradates arise much beyond the penultimate cubital cross-vein 17

17. A reddish or dark spot at each corner of the pronotum; no marks under eyes *tetrasticta*

Not four spots on pronotum, a mark under each eye . . 18

18. Pronotum red on sides; cubital area as broad as post cubital area; usually twelve radials, and but three or four inner gradates *brevihirta*

Pronotum not red on sides; cubital area not nearly as broad as post cubital area, all cubital cells longer than broad; usually about ten radials and five inner gradates *fairchildi*

19. Inner gradates strongly divergent from the outer ones 20

Gradates parallel or nearly so; often a red or dark mark under eye 21

20. Gradates converge behind so their bases are near each other *bouvieri*
 Gradates have bases very far apart *divergens*
21. Pronotum as long as broad, with an interrupted red stripe each side, not on margin 22
 Pronotum broader than long 23
22. Pronotum much longer than broad; inner gradates nearer to radial sector than to outer, arise at or before penultimate cubital cross vein *angusta*
 Pronotum only a little if any longer than broad; inner gradates arise beyond penultimate cubital cross-vein . *yucatanensis*
23. Divisory cell ends at or before the cross-vein above; cheeks reddish *exotera*
 Divisory cell ends well beyond the cross-vein above . . 24
24. Cheeks dark; most cross-veins dark at ends; inner gradates parallel, each veinlet far from next . . . *perfecta*
 Cheeks pale; cross-veins not dark at ends; inner gradates slightly divergent and each veinlet is close to next . . *forrceri*
25. A dark mark in a curve across upper edge of clypeus; palpi marked with dark; gradates parallel . . . *astecana*
 No dark across on clypeus or face 26
26. Two dark lines on each basal antennal joint . *bilineata*
 But one dark line on basal antennal joint 27
 No dark line on basal antennal joint 31
27. Black spot on cheeks; palpi pale 28
 No dark on cheeks; pronotum reddish on sides 29
28. Radial area not as wide as postcubital area; many cross-veins dark *gradata*
 Radial area about as broad as the postcubital; posterior half of wing with mostly pale veins (except gradates) . *indicata*
29. Inner gradates near to radial sector, gradates not quite parallel; many costals wholly dark *sarta*
 Inner gradates close to outer row and parallel thereto . 30
30. Some gradates and some branches of radial sector bordered; pronotum about twice as broad as long . . *berlandi*
 No gradates nor other veins bordered; pronotum only a little broader behind than long, narrowed toward front . . *adoina*
31. Palpi partly dark; cubital area as broad as the costal

- area; costals and radials wholly dark; pronotum not margined with reddish 32
- Palpi not marked with dark, costals and radials less dark; wings rather slender 33
32. Pronotum with a pair of submedian dark stripe . *incerta*
 Pronotum without any stripes *leptana*
33. Margin of pronotum reddish 34
 Margin of pronotum not reddish 35
34. Cheeks with reddish mark; basal joint of antennæ reddish *lateralis*
 Cheeks not marked *claveri*
35. Inner and outer gradates very close to each other, and parallel *everes*
 Gradates widely separated, inner sloping upward, and not parallel *everina*
- Species that I have not recognized in the material and could not place from the descriptions and notes, some of which are probably synonyms.

Chrysopa sanguinea Navas 1927, near to *caligata*, but it does not agree in various points.

Chrysopa rubricosa Navas 1914, the figure shows marks on head that I have not seen in any species.

Chrysopa effusa Navas 1911, may possibly be *Ch. gradata*; the latter has some of the branches of cubitus as Navas figures for *effusa*, but the divisory cell is not dark.

Chrysopa guatemalteca Navas 1914 is very near *Ch. sarta* Bks. There are fewer gradates in *sarta* than stated for *guatemalteca*, and *sarta* has no dark in hind wing, and antennal stripe broad. If the same, *guatemalteca* has a month or more priority.

Chrysopa bouvieri Navas 1923 and *Ch. divergens* Navas 1931 according to description and Smith's notes must be very similar if not identical; those we have agree possibly a little better with *divergens*.

Chrysopa bulbosa Navas 1926 will run in the key to *Ch. infausta*; however, there is nothing unusual about the basal joint of antennæ in *infausta*; and *infausta* has the stripe on basal joint lateral, not dorsal, the pronotum not margined, etc.

Chrysopa cajensis Navas 1930 in table goes to *yucatanensis* and I consider it the same.

Chrysopa hieronyma Navas 1917 seems to be *tetrasticta*.

Chrysopa obesa Navas 1929. A broad bodied species with wholly green wings; may be a *Nadiva* but not *N. balboana*.

Chrysopa senior Navas 1927, wing 20 mm. long, is different from any I have.

Chrysopa morrisoni Navas 1914, veins all green, has dark dots or lines on vertex or pronotum, and thus readily separated from the all green veined species known to me.

Chrysopa varicosa Navas 1914 is stated to have a dark lunule below each antenna, and peculiar modifications of certain veinlets of the inner gradates; I have seen similar modifications in one species, but that species has no lunules on face, nor does it agree otherwise with the description of Navas, so it is probably also a distinct species.

Chrysopa lafoni Navas 1911, and *Ch. nativa* Navas 1911, both from Costa Rica and fore wings 17 mm. long, do not fit anything I have seen.

Chrysopa sulcata, *Ch. salleana*, *Ch. ceratica* of Navas and *Ch. explorata* Hagen belong to *Nodita*; *Ch. dolicharthra* Navas is a *Meleoma*.

Chrysopa externa var. *marginata* Navas 1927, from Guatemala, is described in one line and a half. The pronotum is marked on the anterior middle with dark red; I have not seen it.

Chrysopa josephina Navas 1926 is said to have twelve joints of antennæ black, and outer gradates bordered; it agrees fairly well with what I have as *berlandi*, but here the gradates are not bordered, but this is not always dependable.

Chrysopa josephina Navas 1930, appears to be *Ch. angusta* Navas.

Chrysopa longicella Navas 1914; I identify this with *Ch. bimaculata* McClendon, described from southern Texas; I have specimens from Guatemala, Nicaragua, and Canal Zone; except for minor details and size there is little to separate this from *tolteca* Bks. and so I have united them. *Ch. valida* from Baja California is closely related and with more material may prove to be the same.

Chrysopa lateralis Guerin 1843, I have not seen but placed in synopsis according to his description; it was from Vera Cruz, Mexico.

RECORDS

Chrysopa nigricornis Burm. 1839

One from Durango, Mexico, March.

Chrysopa leptana Bks. 1914

Type from Oaxaca, Mexico, another from Apatzingan, Mexico, 7 August.

Chrysopa gradata Navas 1913

From Rosaria San Juancito, Honduras.

Chrysopa indicata Navas 1914

From Jalapa, Vera Cruz, Mexico, La Campana, Pan., September, and Santa Ana, Costa Rica, March.

Chrysopa everes Bks. 1920

From Puerto Castilla, Honduras, 21 June, and Barro Colorado, Canal Zone, 10 to 13 November, 26 February, and 23 March.

Chrysopa azteca Bks. 1903

Type from Tuxpan, Mexico, 9 May.

Chrysopa berlandi Navas 1923

From Barro Colorado, Canal Zone.

Chrysopa claveri Navas 1911

From Barro Colorado, Canal Zone; Cayuga, Guatemala, October.

Chrysopa incerta Bks. 1895

Types from El Taste, Baja California.

Chrysopa sarta Bks. 1914

Type from Orosi, Costa Rica.

Chrysopa tolteca Bks. 1901

Type from Tomellin, Oaxaca, Mexico, June; others Chavarrillo, Vera Cruz, Mexico, April; Cayuga, Guatemala, May; Chinandega, Guatemala, Gualan, Guatemala, 2 December; and Barro Colorado, Canal Zone, Tuxtepec, Oaxaca, Mexico, November, and Tabernilla, Canal Zone, May. Normally there is but one branch from the third cubital cell to the hind margin.

Chrysopa valida Bks. 1895

Types from El Taste and San Jose del Cabo, Baja California, September. The name is not preoccupied by *Hemerobius validus* Erichson as the latter belongs in the genus *Berkmansus*.

Chrysopa dampfina Navas 1927

Puerto Castilla, Honduras, 21 June.

Chrysopa arioles new name

From Honduras, June, and Piedras Negras, Peten, Guatemala, April-May. This is the *C. binaria* Navas 1928, but he had already used the name in 1923 for a South American species.

Chrysopa mexicana Bks. 1901

From Hapan, Vera Cruz, Mexico, July, and San Pedro, Coahuila, Mexico, 22 August.

Chrysopa exotera Navas 1914

From Tuxpan, Mexico, 9 May, Guadalajara, Mexico, 14 Sept., 25 June, Tegucigalpa, Honduras, 2 February, Rosario San Juancito, Honduras, Panajachel, Guatemala, 20 March, and Santa Engracia, Mexico, 11 April.

Chrysopa divergens Navas 1931

From Barro Colorado, Canal Zone, 26 February, 13 March, 19 April.

Chrysopa tetrasticta Navas 1914

From Moca, Guatallon, Guatemala, March-April.

Chrysopa angusta Navas 1914

From Rosario Mines, Honduras, 20 March.

Chrysopa yucatanensis Navas 1929

From Puerto Cortez, Honduras, 18 March, and Barro Colorado, Canal Zone, 11 February, and Frijoles, Canal Zone, 18 February.

Chrysopa perfecta Bks. 1895

Types from El Taste, and San Lazaro, Baja California.

Chrysopa forreri Navas 1914

From Mazatlan, Mexico.

Chrysopa parishi Bks. 1913

From Barro Colorado, Canal Zone, 15 July, 13 November, and El Volcan Chiriqui, Panama, 17 February.

Chrysopa facialis Bks. 1905

Many from Durango, Mexico, in March, April, May, and June, also San Juan de Allende, Mexico, 15 March. Gomez Palacio, Durango, Mexico, May, San Pedro, Mexico, 14 December, and Guanajuato, Mexico.

Chrysopa californica Coq. 1890

From Tlahualito, Durango, Mexico, 26 August, and Guadalajara, Mexico, 14 August.

Chrysopa comanche Bks. 1938

From San Jose de Guaymas, Mexico, 10 April, Sierra de los Burros, Coahuila, Mexico, 8 and 18 June, Guadalajara, Mexico, 25 June, Juarez, Mexico, 3 July, Panajachel, Guatemala, 20 March, Puerto Castilla, Honduras, 4 April, and La Ceiba, Honduras.

NEW SPECIES

Chrysopa adoina sp. nov.

Head pale, no marks on face; palpi unmarked; antennae black, except basal joint pale with a reddish stripe above; pronotum with a reddish stripe along each side, rest of thorax, abdomen and legs unmarked.

Wings with very pale venation, some costals and radials, cubitals and post cubitals brown in middle, rarely all over, gradates pale brown, not bordered, intermediates dark at lower end, branches of radial sector not dark anywhere; in hind wings the gradates are faintly dark.

Pronotum a little broader behind than long, narrowed toward front. Fore wings have three or four inner, seven outer gradates, parallel and near each other; branches of radial sector scarcely bent at inner gradates; eleven radials; third cubital cell longer than second, divisory cell long, slender and narrow toward tip, base slightly oblique, six cubitals beyond; costal area not as broad as postcubital, but about as broad as cubital, radial area plainly a little broader than postcubital area, the radial sector, however, but little curved. In hind wings ten radials, seven cubitals, only one or two inner, and six outer gradates, parallel, and near each other.

Length of fore wing 12 mm., width 4 mm.

Two taken at quarantine, one at New Orleans from Mexico, 4 Febr. 1936, and the other at Charleston from Honduras,

26 June, 1931, apparently associated with bananas. Type U.S.N.M., paratype M.C.Z. 25643. Differs from *berlandi* as shown in table; it has much the appearance of *Ch. cubana*, but it is larger, the pronotum a little longer, sides more sloping forward, and the costal area is proportionally a little broader.

Chrysopa annotaria sp. nov.

Face pale, a red-brown stripe on cheeks, no other marks; palpi deep black; antennæ pale at first, but soon brownish, not longer than wings, basal joint with a red line on outer side and above is a short reddish line, not reaching either end (probably absent in some specimens); vertex with a red dot each side behind near eye; pronotum pale, in front each side suffused with reddish, broader than long; rest of thorax pale; abdomen mostly black above. Fore wings with gradates dark, and the inner ones bordered with brown; costals and radials rather dark at anterior ends, a few other veins toward base partly dark, last cubital dark, and the marginal forkings partly dark.

Hind wings with pale venation, almost no veins darkened, some of the gradates faintly in certain views; stigma greenish.

In fore wing six inner and outer gradates, the outer row parallel to outer margin, the inner row, arising from near penultimate cubital, curves upward toward the radial sector; the second veinlet in this gradate row has chitinous dots or lines close by in the membrane and is more broadly bordered than the others; the branches of the radial sector are much bent at the inner gradates; six cubital cross-veins beyond the divisory cell, latter ends much beyond the cross-vein above; third cubital cell hardly as long as second, and no broader; subcostal stigmal area with two or three cross-veins. Costal area at broadest as broad as postcubital area, and broader than the radial area, latter, at broadest, about twice as broad as cubital area.

In hind wings the gradates are also far apart, inner of five, outer of six, but not very divergent.

Length of fore wing 14 mm., width 5 mm.

From Boquete, Chiriqui Province, Panama, 10 May (Fairchild). Type M.C.Z. no. 25645.

Chrysopa varicosa Navas has, according to description and Smith's notes, a very similar wing, with the peculiarities of the inner gradates, but the face has a reddish brown lunule under each antennæ, and no dark line on basal joint of antennæ. *Ch.*

sanguinea Navas has a line on antennæ, but palpi pale, and a line behind the antennæ. Other species with line on basal antennal joint have been seen, and are in the synoptic key.

Chrysopa batesi sp. nov.

Head pale; a broad red stripe on each side covering cheeks and extending inward and upward on inner side of eye, past the antenna, and broadly onto sides of vertex; palpi pale, antennæ pale, basal joint with a rather broad outer reddish stripe, pronotum much broader than long, sides parallel, two red spots half way from center to side margin; mesonotum with a red mark each side on anterior lobe, extending back along middle; abdomen with a row of red marks each side above.

Fore wings with the gradates wholly dark; origin of radial sector, radials almost wholly, and some costals at lower ends dark; stigma pale yellowish. In hind wings the gradates slightly dark. In fore wings four or five inner and seven outer gradates, outer row parallel to margin, inner row plainly divergent, six cubitals beyond the divisory cell, latter ends much beyond the cross-vein, third cubital cell as long as second, broader. In the subcostal stigmal area two or three cross-veins; hairs on veins rather short, branches of radial sector slightly bent at inner gradates; costal area at broadest is equal to the radial and also to postcubital area, latter about a third broader than cubital. In hind wings four inner and five outer gradates, not quite parallel, and the inner series nearer to the radial sector.

Length fore wing 12 mm., width 4.5 mm.

From Barro Colorado, Canal Zone, 9 October (M. Bates).
Type M.C.Z. no. 25646.

Agrees partly with *bouvieri* and *divergens*; but neither have stripe on basal joint of antenna, and neither have extensive red marks on head.

Chrysopa brevihirta sp. nov.

Head pale, a faint reddish mark between antennæ and also a faint reddish suffusion on the vertex just back of each antenna, no mark on cheeks; palpi and antennæ pale yellowish, unmarked; pronotum pale, with a red stripe each side, rest of thorax, abdomen, and legs pale, unmarked. Fore wings with the gradates brown, radials and costals, and a few other cross-

veins toward base paler brown; in hind wings the gradates only faintly brown.

Pronotum broader behind than long in middle, sides sloping forwards. In fore wing the costal area at broadest is not nearly as wide as the radial area, latter a little broader than post-cubital area, which is scarcely wider than the cubital area; three or four inner gradates, seven or eight outer ones, in parallel series, the inner row nearer to outer than outer to the margin, inner arising not far before the last cubital cross-vein; six cubitals, beyond divisory, latter ending beyond the cross-vein above; the third cubital cell a little longer than the second, and plainly broader; twelve radial cross-veins; the costal stigmal area hardly one half as broad as the subcostal area, and the latter with six or seven cross-veins. Hair on veins very short, on the broadest costal cells the hair is not one fourth the width of the cell; although several of the costal cells toward base are unusually broad; there are the usual seven cross-veins before the origin of the radial sector.

In hind wings three or four inner and seven outer gradates, parallel, and near together.

Length of fore wing 14 mm., width 5 mm.

From Tuxpan, Mexico, 9 September (McClendon coll.).
Type M.C.Z. no. 25649.

Chrysopa caligata sp. nov.

Head pale, unmarked; palpi pale; antennæ longer than fore wings, pale, first joint with a red stripe above; pronotum broader than long in middle; narrowed near front a red stripe each side, not quite on margin; rest of thorax and abdomen pale, unmarked.

Fore wings with some costals, radial, cubitals, and branches of cubitus dark in middle, or almost wholly dark; gradates plainly dark brown; some marginal forkings dark; stigma pale; in hind wings outer gradates dark. In fore wings the radial area is much broader than the costal area and as broad as the post-cubital area, latter about as broad as the costal area; six cubitals beyond divisory cell, latter ends plainly beyond cross-vein above; three or four inner, and seven or eight outer gradates, inner close to and parallel to the outer row; third cubital cell as long as second; branches of radial sector scarcely bent at inner gradates; hair of moderate length. In hind wings two or

three inner and six or seven outer gradates, in parallel rows. Subcostal stigmal area rather broader than costal and with five cross-veins.

Length of fore wing 12 to 13 mm., width 4.2 to 4.5 mm.

From Barro Colorado, Canal Zone (Banks), and Puerto Cabello, Panama, 11 June (Englehart). Type M.C.Z. no. 25648; paratype, Barro Colorado, C. Z., 11 March (A.M.N.H.). Possibly close to *Ch. sanguinea* Navas, but nothing is said of red on pronotum, and there is a mark on cheek (not in *caligata*). One from Guatemala, August (U.S.N.M.) is probably the same.

Chrysopa everina sp. nov.

Similar to *Ch. everes*; black antennæ beyond second joint, becoming paler beyond middle; cheeks, palpi, basal antennal joint, all unmarked; nor even a red dot by eyes on the vertex, pronotum, thorax, abdomen, legs all pale. Wings with the gradates in fore wings dark brown, in hind wings more faintly brown; scarcely any other veins dark in either wings, some of radials a darker green in middle; stigma only faintly darker. Antennæ shorter than wings; pronotum much broader than long, sides parallel, front margin convex, a distinct median groove in the part behind the transverse furrow.

Wings moderately broad, hind wings acute at tip. In fore wings the costal area at widest is as broad as the postcubital area, and almost equal to the radial area; the cubital area about three fourths as wide as the postcubital; inner gradates five, outer seven, inner row plainly a little divergent from the outer and arising from near the penultimate cubital cross-vein, last three of inner series nearer to radial sector than to the outer row; six cubital cross-veins beyond the divisory cell, latter ends beyond the cross-vein above; third cubital cell as long as second and broader. In hind wings the gradates are also rather far apart, three or four inner, and five or six outer ones.

Length of fore wing 11.5 mm., width 4.5 mm.

From Lancetilla, Tela, Honduras, 4 May (M. Bates). Type M.C.Z. no. 25644.

Readily separated from *everes* by the more widely separated gradates.

Chrysopa fairchildi sp. nov.

Head, palpi, and antennæ pale, without marks, vertex each side by eye faintly suffused with rufous; pronotum, thorax,

abdomen, and legs pale, unmarked; wings with greenish venation, in fore wings the gradates wholly dark; some of the costals in middle, some branches of cubitus, the last few cubitals, and radials more or less, dark; in hind wings the gradates less plainly dark.

The antennæ shorter than wings, pronotum broader behind than long in middle, sides sloping toward front.

Wings moderately broad, hind wings acute at tip; in fore wings five inner, seven outer gradates, in parallel rows, the inner much nearer to outer than outer row to margin, the inner row arising nearer to the last cubital cross-vein than to the penultimate. Costal area at widest not equal to radial area, the latter equal to the postcubital area, and this last about one and a half times broader than the cubital area; six cubital cross-veins beyond divisory cell, the latter ending beyond the cross-vein above; the third cubital cell as long as the second and a little broader; branches of radial sector but little bent at inner gradates; in hind wing two to three inner and five outer gradates, parallel and near each other.

Length of fore wing 12 mm., width 4.3 mm.

From Juan Mina, Rio Chagres, Canal Zone, 11 April (G. B. Fairchild). Type M.C.Z. no. 25650.

Chrysopa infausta sp. nov.

Body pale, no mark on face nor cheeks; palpi pale; antennæ pale, the first joint with a red stripe on outer side, and the second joint partly reddish; pronotum with a narrow red line on each side margin; rest of thorax, the abdomen and legs all pale, unmarked.

Fore wings with nearly all cross-veins wholly or partly dark, and both gradate series bordered with dark, branches from radial sector and from cubitus mostly pale, marginal forkings dark; stigma pale yellowish.

Wings rather narrow; fore wings almost and hind wings plainly acute at tips. In fore wings the costal area at broadest not nearly as broad as the radial area which is equal to the postcubital area, the latter one third broader than the cubital area; six cross-veins beyond the divisory cell, latter ends well beyond the cross-vein above; four or five inner, six outer gradates, outer parallel to outer margin, inner somewhat divergent from outer, last one or two of inner series nearer to outer than

the others; branches of radial sector not at all bent at inner gradates; third cubital cell about as long as second, the divisory cell a little more than one half its length; the subcostal area of stigma plainly broader than the costal part and with three cross-veins. In hind wings three inner and five outer gradates. not parallel.

Pronotum broader than long, sides parallel, but narrowed near front.

Fore wings 10.5 mm. long; 3.5 mm. wide.

From Hamburg Farm, Costa Rica, April (C. W. Dodge).

Type M.C.Z. no. 25647.

Of the size and general appearance of *Ch. gradata* and *Ch. longicella*; *gradata* has black antennæ, dark mark on cheeks, and gradates parallel. *Ch. longicella* has the palpi partly black, the gradates not bordered, and the rows nearer each other, and parallel. *Ch. infausta* is very similar to *bimaculata*, but differs in pale palpi and the bordered gradates.

Key to Species of *Nodita*

1. Antennæ beyond second joint wholly black, pronotum showing transverse groove 2
 - Antennæ if dark only on basal third or less, or only beneath 3
2. Outer part of hind marginal vein of hind wings plainly brown; palpi pale; basal joint of antenna with reddish stripe *panamana*
 - Outer part of hind marginal vein of hind wing not brown, palpi marked with dark; basal joint of antennæ not plainly striped *ramosa*
3. Very large species, fore wings about 20 mm. long or longer; hind margin of hind wings often with a distinct brown shade or at least the marginal vein brown 4
 - Smaller; hind margin of hind wings not brown 8
4. Pronotum with a row of reddish spots or a stripe much before side margin, pronotum longer than broad 5
 - If red on pronotum it is close to side margin, and pronotum about as broad as long 6
5. Pronotum with a row of red spots each side *luctuosa*
 - Pronotum with a stripe each side *egregia*

6. Radial sector dark for a space before the stigma, usually outer gradates only dark 7
 Radial sector not partly dark, both rows of gradates dark *singularis*
7. Divisory veinlet ends on end of cell as in *Leucochrysa*; pronotum with a reddish spot each side near middle of length *alloneura*
 Divisory veinlet normal for *Nodita*; pronotum with a stripe each side *maronica*
8. Radial sector in fore or hind wings black in part near stigma, at least branches each side black 9
 Radial sector not black in part 15
9. Palpi partly black; often a dark or reddish band across lower part of face, or a spot on each side 10
 Palpi pale; if a band on face it is just below antennæ 14
10. Tip of hind wings dark; usually some outer gradates bordered with dark 11
 Tip of hind wings not dark; outer gradates not bordered 12
11. Inner gradates dark; most cross-veins dark; basal part of antennæ below with dark marks *orthones*
 Inner gradates partly pale; many cross-veins pale; basal part of antennæ not dark below, some cross-veins bordered *askanæ*
12. Antennæ black about one third way out beyond second joint; marginal forks not wholly dark *navasi*
 Antennæ at most dark for a short distance below 13
13. Radial sector in both wings partly black; end of third cubital cell very oblique; marginal forks almost wholly black *lancala*
 Radial sector in hind wings only partly dark; end of third cubital cell scarcely oblique; marginal forks dark only at base; wings narrower *caucella*
14. A red spot each side near middle of face *pallesceus*
 No such spots *mexicana*
15. Hind wings much marked with dark, the tips black *postica*
 Hind wings little if any marked with dark 16
16. Basal joint of antennæ nearly wholly dark above, and often on outer side; usually several of the gradates bordered;

palpi pale; pronotum hardly longer than broad, and with a reddish line on side *cortezii*

Basal joint at most with one or two stripes 17

17. One or two dark or reddish bands across face; vertex with an angulate red line 18

No bands across face, at most a spot each side 20

18. Two stripes on basal joint of antennæ, one inner, one above; pronotum plainly longer than broad, with two dark spots each side *Leucochrysa duarte*

Basal joint with but one dark stripe 19

19. One dark band across face, basal part of antennæ dark for a few joints beyond the second *maculata*

Two reddish bands across face and upper clypeus, basal part of antennæ not black; vertex with some dark transverse marks more or less distinct *serrei*

20. Several joints of antennæ beyond the second with a dark mark beneath; vertex with an angulate red line in front; palpi pale *antennata*

No joints marked beneath with dark on antennæ 21

21. Basal joint of antenna with a reddish or dark stripe, several of the outer gradates bordered 22

Basal joint of antenna without a distinct stripe, but sometimes wholly pale rufous; outer gradates not so plainly bordered *læertes*

22. Palpi pale, unmarked *punctata*

Palpi largely dark *salleana*

SPECIES DESCRIBED FROM THIS REGION BUT NOT RECOGNIZED, OR PERHAPS SYNONYMS

Nodita explorator Hagen 1861, type appears to be lost; agrees in some ways with *N. antennata*, but said to have a large dark spot on face.

Chrysopa sulcata Navas 1921, according to Smith notes is a *Nodita*; in the synopsis it will run to *duarte* from which it differs in having the pronotum broader than long.

Nodita campioni Navas 1914, is related to *askanis*, but the latter has a band across lower part of face at clypeal border, inner gradates not dark, and pronotal stripes have an inward projection.

Nodita fuscinervis Navas 1914, a rather large species, fore wing 19 mm. long, is about size of *pallescens*, but latter has the antennæ pale at base, no veins near wing base black, face differently marked.

Nodita nevermanni Navas 1928, is said to have basal antennal joint dark above which would thus fit *cortezi*, but the figure shows the pronotum shorter.

Nodita salleana Navas 1911 (*Chrysopa*). It is put in the synopsis through description and Smith notes.

Nodita antica Navas 1913 will run out to *N. punctata*, but from figure is a *Leucochrysa*. *Nodita lateralis* Navas 1913 also goes to *N. punctata* in table, but may be different.

Nodita superior Navas 1913 is a rather large species, with two curved marks on vertex; I have not seen it.

Nodita zapotina Navas 1913 seems to agree well with *N. antennata*.

Nodita centralis Navas 1913 may be *luctuosa* or near it, but the description does not fully agree.

Nodita ceratica Navas 1911 (*Chrysopa*) is a small species with several joints of antennæ near base dark; I cannot match it with any I have here.

Nodita alternata Navas 1913 may be the same as *N. mexicana* Bks.

Nodita indiga Navas 1928. Probably related to what I described as *N. askanes*, but no mention of dark area on radial sector, and over outer gradates.

Nodita postica Navas 1913 seems to be close to *radiosa* Gerst. or the same; I have not seen *N. radiosa* from Central America.

RECORDS

Nodita luctuosa Bks. 1914

Type from Orosi, Costa Rica.

Nodita egregia Navas 1913

From El Valle, Coclé Prov., Panama, 20 May.

Nodita maronica Navas 1915

From Barro Colorado, Canal Zone 10-13 November and 3 January. Described from French Guiana.

Nodita ramosa ? Navas 1917a

From Barro Colorado, Canal Zone, 20 July, 2 August; both specimens have palpi marked with black and may be new.

Nodita maculata Navas 1928

From Boquete, Chiriqui, Panama, 10 May, and El Volcan Chiriqui, 30 April.

Nodita singularis Navas 1913

One from El Cermeno, Panama, April-May, agrees well with the description.

Nodita caucella Bks. 1910.

From El Cermeno, Panama, April-May, and Panama City, Panama, 4 May. Described from Colombia.

Nodita antennata Bks. 1915

Type from Tuxpan, Mexico, 4 May.

Nodita mexicana Bks. 1900

From Cavarillo, Vera Cruz, Mexico, Lancetilla, Honduras; and Taboga Island, Panama, 10 June.

Nodita punctata Bks. 1903

Type from Guatemala; others, Barro Colorado, Canal Zone, November; and Corozal, Panama, 12 February.

Nodita cortezi Navas 1913

The specimens which agree with the description and figure have a dark brown spot below the base of each antennæ, not mentioned by Navas or Smith, but they could be overlooked.

N. calverti Bks. 1914a is the same species, published a few months later. Specimens from Pedregoso, Costa Rica, February; La Campina, Panama, September, El Cermeno, Panama, April to May, and Costa Rica. *N. nevermanni* Navas 1928 may be the same species.

Nodita navasi Kimmins 1940

Kimmins lately renamed the second *Nodita alternata* 1914 of Navas; specimens from Lancetilla, Honduras.

Nodita serrci Navas 1923

From El Cermeno, Panama, April to May.

DESCRIPTIONS OF NEW SPECIES

Nodita alloneura sp. nov.

In general structure close to *N. maronica*, but has the divisory cell as in *Leucochrysa*. Markings also similar, the radial sector

is black for some distance before stigma and branches each side black for a short distance; the marginal forks are wholly brown, and the hind margin of hind wings is brown; both rows of gradates pale. Stigma yellowish, with a prominent black spot at base. There are no marks on head, and antennæ pale. The pronotum is shorter than in *maronica*, being plainly broader behind than long in middle; there is a red spot near margin at about middle of length; lateral lobes of mesonotum with a small red spot in front; abdomen with a reddish spot each side on each segment, forming a row close to the median line.

The fore wings are nearly as broad as in *maronica*; the radial sector strongly curved, the radial area at widest much broader than the costal area; the inner gradates of twelve or thirteen extending somewhat basally; the outer gradates probably of twelve or more, the more basal ones being perfectly continuous with the medius, the two rows being more divergent and further apart than in *maronica*. There are nineteen radials and eight cubital cross-veins beyond the third cubital cell. In hind wing the radial sector is also black before stigma, other veins pale; the gradates, eight to ten, are more nearly parallel than in fore wing.

Length of fore wing 20 mm., width 7.5 mm.

One from Barro Colorado, Canal Zone, 2 December (M. Bates coll.). Type M.C.Z. no. 25652.

Nodita askanes sp. nov.

Face with a reddish spot each side between the eye and upper corner of clypeus; maxillary palpi largely black; antennæ pale, basal joint with a rather broad reddish stripe on outer side, second joint with a dark mark, six to ten joints beyond marked with black beneath; vertex with a reddish spot each side just above outer base of antennæ; pronotum with a moderately broad red stripe each side, at about middle there is a projection inward (somewhat like *indiga*), mesonotum usually has a reddish dot each side, and sometimes one over base of fore wings; abdomen with two large black spots above, one toward base, other toward tip; legs pale, unmarked..

Fore wings with radial sector more or less plainly black near the stigma, and two or three branches each side are black, and some of them bordered near the sector; origin of radial sector, last cubital cross-vein, first one or two of outer gradates also

bordered with brown; outer gradates and some of the inner row, most of the marginal forks at base and sometimes the last two or three of the branches of cubitus are brown; some of the costals, radials, and cubitals are usually partly brown; stigma brown at base. In hind wings the cross-veins and gradates mostly pale, sometimes one or two of the marginal forks dark, the radial sector is faintly dark toward the stigma and latter brown at base; the tip of wing has a prominent brown spot.

The pronotum is broader behind than long and with a median depressed line. In the fore wings the costal area (at broadest) is about as wide as the postcubital area, not as broad as the radial area; basal side of divisory cell moderately oblique and about one half to two fifths of the outer side; seven cubitals beyond divisory, all the cells longer than high; gradates usually five or six in each row, the rows parallel, but not very near each other, the branches of radial sector much bent at inner gradates; several cross-veins in subcostal stigmal area, many in costal area.

In hind wings usually four or five inner, five or six outer gradates, nearly parallel, seven cubital cross-veins.

Length fore wing 13 mm., width 4.5 mm.

From Moca, Gautalon, Gutemala, March, April, 1000 m. (Bequaert), old specimen "Guatemala," and Subirana, Yoro, Honduras, 7 March (Stadelman). Type M.C.Z. no. 25654.

Nodita lærtes sp. nov.

Face with a small reddish spot below each antenna, and not far from inner edge of eye (sometimes obscured by discoloration); palpi pale; vertex with a small spot or two short fine divergent lines of red in front, or sometimes absent; antennæ pale, basal joint without stripe, but sometimes more or less wholly rufous above; no dark dots on under side of antennæ toward base; pronotum with a short stripe or line near middle each side, sometimes reaching front; mesonotum usually brown on the lateral lobes and extending slightly over base of wing; the front of anterior lobe usually marked with reddish or dark; abdomen with two large dark spots above; legs pale.

Fore wings with gradates and last one or two cubitals wholly dark, not bordered; origin of radial sector, marginal forks at base, and many cross-veins at one or both ends dark; stigma

with a prominent dark brown spot at base. In hind wings the venation is mostly pale, the outer gradates dark.

Pronotum hardly as long as broad behind, narrowed toward front, depressed along middle. Fore wings rather broad and blunt toward tip; ten or eleven radial cross-veins, four to six inner and five to seven outer gradates, nearly parallel; the inner gradates usually arising beyond the penultimate cubital cross-vein; the branches of radial sector not much bent by the inner gradates; the costal area almost as broad as the postcubital, the radial area broader than either; in hind wings seven cubital cross-veins, about eight radials, gradates with usually four in each row, parallel, but rather widely separated.

Length of fore wing 10 to 11.5 mm., width 4 to 4.5 mm.

Several from Juan Mina, Rio Chagres, Canal Zone, 11, 12 April (Fairchild coll.). Type M.C.Z. no. 25656. *N. ceratica*, *indiga*, and *championi* have dark dots on under side of antennæ toward base, but are otherwise somewhat related.

Nodita orthones sp. nov.

Face with a black spot under each antenna, and another in middle below them, maxillary palpi mostly dark, the depression of vertex dark each side; antennæ pale, basal joint rather slender, with a reddish streak on outer part above, not a definite stripe, rest of antennæ wholly pale; pronotum with a reddish stripe each side, rather broad in front, middle of pronotum depressed and dark (probably discolored) meso- and metanotum mostly dark, extending out on base of wings; abdomen without definite dark spots; legs pale.

Fore wings with the radial sector dark for quite a long distance; gradates black, outer ones and base of radial sector bordered; nearly all other cross-veins and marginal forks wholly dark brown, a few of radials not wholly dark, the intermediates and branches of radial sector to the inner gradates dark, between the gradates series the branches are mostly pale; stigma with a rather pale brown spot at base. In hind wings some of the costals, the gradates, the marginal forks, and the last few radials are dark, the radial sector is plainly dark for a short distance; the tip of wing and the base of stigma are brown.

The pronotum is nearly as long as broad behind, the median depression prominent, no transverse groove.

The fore wing has the costal area rather narrow, not as broad

as the postcubital area, and the latter not nearly as broad as the radial area; base of divisory cell about two thirds of outer side, and moderately oblique, tip of third cubital cell plainly oblique, seven cubitals beyond the divisory, the cells mostly longer than broad; a few cross-veins in subcostal stigmal area, many in the costal area, five inner and six outer gradates, only slightly divergent, branches of radial sector much bent at inner gradates. In hind wing four gradates in each series, rows slightly divergent, seven cubital cross-veins.

Length of fore wing 13 mm., width 4.7 mm.

One from Juan Mina, Rio Chagres, Canal Zone, 12 April (Fairchild). Type M.C.Z. no. 25655.

Nodita pallescens sp. nov.

Face with a rounded red spot on each side below antenna; palpi pale; front of vertex with an angulate red line across; antennae pale, the basal joint with a faint reddish spot at outer tip, no distinct stripe; pronotum with a faint line each side, on the posterior part is a dark line on each side, its front end bent toward the middle; meso- and metanotum greenish, unmarked. Abdomen pale, slightly darker at ends of segments; legs pale, very slender.

In the wings the veins are very fine; in fore wings the gradates are mostly dark (not black), the marginal forks also, the radial sector at base and toward stigma a rather long stretch dark; nearly all the cross-veins are partly dark, usually only in middle. In the hind wings the radial sector and two or three radial cross-veins dark near stigma; the gradates are scarcely darkened, the outer ones more plainly so; the stigma is not plainly brown at base, but the subcostal vein there is black.

The pronotum is about as long as broad behind, near front much narrowed.

The wings are long and slender; in the fore wings the costal area is almost as wide as the post-cubital, the radial area broader than either; the third cubital cell is scarcely narrower at base than at the oblique tip; the divisory cell ends far beyond the cross-vein above, the base quite oblique and but little more than one half of the outer side, seven or eight cubitals beyond; eight inner and nine outer gradates, the rows slightly divergent, branches of radial sector strongly bent by inner gradates, and more than usual by the outer series; fifteen radial cross-veins;

subcostal stigmal area with only a few cross-veins, costal area densely veined. In hind wings four or five inner and six outer gradates, nearly parallel, but not very near each other; eight cubital cross-veins, twelve or thirteen radials.

Length of fore wing 18.5 mm., width 6 mm.

One from San Jose, Guatemala, February 1905 (Baker).
Type M.C.Z. no. 25651.

Nodita panamana sp. nov.

Head pale, a reddish spot or line under each eye; palpi pale; first three joints of antennæ pale, beyond deep black, basal joint with a reddish stripe above. Thorax pale; pronotum with red stripe each side; lateral lobes of mesonotum often with a dark dot toward front; abdomen pale, unmarked; legs pale.

Fore wings with long yellowish brown stigma, anterior end darker; gradates and outer marginal forks wholly dark, costals dark at one or both ends, radials and some others dark in middle or at one end; radial sector toward stigma dark for some distance, and dark at origin. In hind wings the radial sector is also dark for a space, the outer gradates and the outer part of marginal vein dark brown.

Pronotum almost as long as broad behind, narrowed somewhat toward front.

In fore wings the costal area at broadest is hardly as broad as the postcubital, the radial area much broader than either; base of divisory cell but little oblique, only about one half length of outer side which is curved; usually six or seven inner and eight outer gradates, not quite parallel, branches of radial sector much bent by the inner gradates; third cubital cell nearly as broad at base as at tip which is oblique, other cubital cells longer than broad, seven cubital cross-veins beyond the divisory; in subcostal stigmal area are a few cross-veins, many in costal area.

In hind wings about five or six inner and seven outer gradates, in slightly divergent rows, and rather further apart than in fore wing; seven cubital cross-veins; the radial area is broader than the postcubital.

Length of fore wing 15 mm., width 5 mm.

Many specimens (alcoholic) from La Campana, Sept., and El Cermen, April, May, June, both Panama (Zetek coll.).
Type in U.S.N.M. Paratypes there and in M.C.Z. no. 25659.

Key to Species of *Leucochrysa*

1. Fore wings about 20 mm. long or more 2
Fore wings about 15 to 17 mm. long 6
Fore wings about 12 to 13 mm. long, divisory vein usually
ends on medius before end of cell 7
2. Fore wing with a dark streak or umbra behind the rhexema
. *dolichocera*
No such streak 3
3. In fore wing a cell behind third cubital cell is opaque,
sometimes also opaque above it *clara*
No such opaque cell 4
4. Radial sector much curved and black for a space before
the stigma *Nodita alloneura*
Radial sector only slightly curved and not black toward
stigma 5
5. Pronotum plainly longer than broad behind, and tapering
forwards *varia*
Pronotum about as broad behind as long in middle, less taper-
ing in front *pretiosa*
6. Base of radial sector covered by a large dark spot; inner
gradates not extended basally *notha*
Base of divisory cell covered by a black mark; inner gradates
extended basally *erminea*
7. Two spots each side on margin of pronotum, one reddish,
one nearly black; a reddish spot under each eye; basal joint of
antennæ with reddish stripe above; outer gradates bordered
. *duarte*
A marginal line on pronotum; no spot under eye; basal an-
tennal joint reddish on outer side *antica*
Leucochrysa variata Navas 1913 and *L. angradi* Navas 1911
I presume are the same as *pretiosa* Bks. 1910, at least I do not
know how to separate them. *L. negata* Navas 1913 appears to
be different from any I have seen, although said to be similar
to *variata*. *L. delicata* Navas 1925, I think is surely *pretiosa*.

RECORDS

Leucochrysa clara McLachl. 1867

From Bugaba, Panama and El Volcan Chiriqui, 24 February.

L. scioptera Navas 1913 is the same species.

Leucochrysa varia Schneider 1851

Recorded from the region by Navas, but probably *pretiosa*.

Leucochrysa pretiosa Bks. 1910

From Barro Colorado, Canal Zone, January, 15, 22, 25 July, December; El Cermenó, Panama, April, May; La Campana, Panama, September, Cayuga, Guatemala, June; Volcan Sta. Marta, Guatemala, June; Limón, Costa Rica, 24 May; and Alta Vera Paz, Guatemala, 24 April. In *pretiosa* the inner gradates are more nearly parallel to the outer and do not extend up so near to the radial sector as in *varia*. Also in *pretiosa* the divisory cell has the outer side little longer than basal side; in *varia* the basal side is usually much shorter, but there is variation; the sure way to separate them is by the longer pronotum of *varia*. From the Hagen collection we have a type or cotype of *varia*.

Leucochrysa notha Navas 1913 is not a *Nodita*, but I have not seen it in my material.

Leucochrysa dolichocera Navas 1913 I have not seen, but is evidently related to the South American group of *longicornis* and so placed in synopsis.

Leucochrysa vulnerata Navas 1914 from Guatemala; probably related to *pretiosa*.

DESCRIPTIONS OF NEW SPECIES

Leucochrysa duarte sp. nov.

Face with a reddish spot each side near eye (not below), the two connected by a faint line; last joint of maxillary palpi mostly black; a dark spot just above base of antennæ, basal joint of antennæ blotched with reddish, on the outer side nearly forming a stripe, second joint reddish, third joint black in front, beyond wholly pale; pronotum with two somewhat rounded reddish spots on each side margin, one at anterior end, very dark, other at about middle; a small reddish spot on each lateral corner of the anterior lobe of the mesonotum, a reddish and blackish mark on base of each wing, scarcely extending over the lateral lobes, rest of thorax pale yellowish; abdomen pale, with three large black spots above, one near base, the others on adjoining segments near tip; legs pale.

Fore wings with a dark spot over base of radial sector, and the outer gradates black and plainly margined with brown, also

over the last cubital, and the bases of marginal forks; inner gradates dark, one or two of them faintly margined; the stigma with a large dark spot at base, and behind are three or four dark radials, faintly margined; the cubital cross-veins are also dark and some slightly bordered; many costals wholly or partly brown. In the hind wings the outer gradates faintly dark; the stigma with a large brown spot, and behind one or two radials dark. The pronotum is plainly longer than broad, the sides parallel. In the fore wings there are eleven radials, five or six outer and five inner gradates, not parallel, rather wide apart, the inner row nearer to radial sector than to the outer row, latter rather close to outer margin; branches of radial sector much bent at inner gradates; veins only sparsely haired; divisory cell long, tip sharp-pointed and on one wing almost reaches the end of cell, base slightly oblique, hardly one half of outer side, seven cross-veins beyond; costal area nearly as wide as post-cubital, but the radial area still broader (at its broadest); cubital area not one half of postcubital. In the hind wings the postcubital area is not quite as broad as the radial; four inner, five outer gradates, nearly parallel, but well separated; six cubitals, eight radial cross-veins.

Length of fore wing 11 mm., width 3.8 mm.

One from Pedrogoso, Costa Rica, 2100 ft., February, (Rounds coll.). Type M.C.Z. no. 25658.

Differs from *Nodita cortezi* in longer pronotum, with two rounded spots each side (instead of one line); the reddish (instead of brown) spots below antennæ, and further down; in the partly black palpi; and the basal joint of antennæ not so much dark; and by the slightly curved radial sector belongs in *Leucochrysa*. From *Leucochrysa notha* and *antica* Navas it is separated by the spots on face and side of pronotum; the stripe on basal joint of antenna on upper (not outer) side; the palpi are marked with dark, and the inner gradates run up closer to the radial sector.

Leucochrysa erminea sp. nov.

Face without definite marks, except dark spot under each eye; palpi pale, marked with dark; antennæ very long, pale, basal joint and second dark above, a faint dark mark over two more joints; pronotum broader than long, sides dark; mesonotum dark over base of fore wings, metanotum dark in front,

scutellum pale; abdomen with two segments toward tip reddish above. Fore wings with dark spot over the short vein below divisory cell, more over base of radial sector; dark spot at base of stigma, another over last cubital cross-vein, one or two cross-veins before also brown, outer gradates brown, also base of outer forks, few cross-veins dark at one end, mostly pale. In hind wings the stigma dark at base, veins mostly pale, outer gradates partly dark.

In fore wings the costal area fully equal to radial area in width; fifteen radials, eight cubitals beyond third cubital cell, eight or nine inner gradates, six outer ones, inner row extended basally, four cubital cross-veins beyond its origin, slightly divergent from outer row. In hind wing eight cubital cross-veins, seven inner and six outer gradates, inner row extended basally a little.

Fore wing 15.5 mm. long, 5.5 mm. wide.

One from Barro Colorado, Canal Zone, August (F. H. Hull).
Type M.C.Z. no. 25657.

Neula Navas

I consider my *Allochrysa titan* as belonging to this genus. In the genotype from Colombia Navas shows an intermediate row of gradates; in *titan* the row is broken, two in one wing, four in other; however, it agrees with *Neula* in many other points. The radial area is broadest toward base (not in middle as in *Nodita*); and at middle (half way from origin to stigma) the radial sector is much nearer to radius than to medius. The costal area is not as broad as the radial area; the antennæ are very long; it differs from *Leucochrysa* chiefly in having the radial sector more sinuous.

Neula titan Bks. 1915

I have seen only the type.

The palpi are partly black; the pronotum broad, the transverse groove near the hind border, in front of groove there is a slight elevation. The postcubital area about twice as broad as the cubital. The third cubital cell has one branch toward the margin and it soon forks, one part running into the fork of first anal vein, the other reaching the hind margin, alike in both fore wings. There are 20 to 22 radials, 13 to 14 inner gradates,

12 to 13 outer, the rows far apart and not parallel, giving room for the middle row; seven intermediates; ten cubitals beyond the third cubital cell. In hind wing eleven gradates in each row, rows fairly parallel; about nine or ten cubitals. The legs are rather stout, the hind tibia about three and a half times the length of the hind tarsus; front tibia hardly more than twice as long as tarsus.

Leimon, Costa Rica, 24 May (Schaus).

Chrysopodes sallei sp. nov.

Body and appendages pale, palpi pale; basal joint of antenna with two red brown stripes, one on outer side and one above; no mark on cheeks, pronotum with a red brown stripe each side; abdomen unmarked.

In the fore wings some of the costals, most of the radials, three intermediates, the gradates, all of the cubitals, and some of the branches of the cubitus are dark; stigma but little marked. Pronotum a little broader behind than long in middle, sides parallel to near front and then much narrowed; the transverse groove close to the hind ridge.

Wings moderately slender, tips in a point, hair of moderate length. In fore wings the costal area is not as broad as radial, the latter a little broader than the postcubital, and this much broader than the cubital area; eleven radials, five cubitals beyond the third cubital cell, all but the last one oblique; divisory veinlet parallel to the medius, latter slopes straight to its marginal fork; four inner and seven outer gradates, the rows parallel and near each other, the inner very far from radial sector. In hind wings two or three inner and four outer gradates, also parallel and near each other, seven cubital cross-veins.

Length of fore wing 14 mm., width 4.8 mm.

One labeled "Mexique Salle" from Hagen collection. Type M.C.Z. no. 25663.

Easily separated from *C. canudasi* Navas by the two stripes on basal antennal joint, fewer gradates, unmarked marginal forks.

Chrysopodes canudasi Navas 1913

Described from Guatemala; I have not seen it.

RECORDS OF OTHER GENERA

Berkmansus cinctipes Bks. 1915

Type from Corozal, Panama. Described as a *Leucochrysa*; in structure like *B. elegans* Guerin, but without large marks. Besides the two dark bands on the tibia the tip of tarsus is black, and the outer margin of wing is dark at end of each vein. There are five or six cubitals beyond the third cubital cell; the gradates are parallel, the inner row almost as near to radial sector as to the outer row.

Chrysopiella sabulosa Bks. 1915

One from Tlahualilo, Durango, Mexico, 30 August, does not differ from specimens from Arizona.

Eremochrysa punctinervis McLachl. 1869

From Tlahualilo, Durango, Mexico, 30 August, and Sierra de los Burros, Coahuila, Mexico, 3 June. Like Texan specimens; *E. digueti* Navas 1911 may be the same species.

Nadiva balboana Bks. 1941

Types are from Barro Colorado, C. Z. in March and April.

Meleoma innovata Hag. 1861

From Contreras, Mexico, 2 July, and Amecameca, Mexico, also Cerro Tancitaro, Michoacan, Mexico, 8 July. *M. mexicana* Bks. 1899 is a synonym.

Meleoma titschacki Navas 1928 described from San Jose, Costa Rica, I have not seen.

Meleoma dolicharthra Navas 1914 (*Chrysopa*), I have not seen; it was described from Guatemala.

Gonzaga torquata Navas 1913

From Trinidad River, Panama, 2 March, and Alajuela River, Panama, 9 April.

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CUTANEOUS MYIASIS DUE TO *CUTEREBRA*
IN MASSACHUSETTS

BY J. BEQUAERT

Museum of Comparative Zoölogy, Cambridge, Mass.

The Tumor Diagnosis Service of the Harvard Medical School recently referred to me a large maggot said to have been removed from the human skin. It was readily recognized as a bot-fly larva of the genus *Cuterebra*. As there appears to be no previous record of a bot of this type causing cutaneous myiasis in man, some further inquiry was made about this case.

Dr. Rene B. LeClair, of Ware, Massachusetts, who sent in the specimen, upon my request gave the following information with kind permission to use it in print. The maggot was extracted by Dr. LeClair in September, 1945, from the skin of a male resident of Ware. It was located about two inches below the right nipple in what was thought at first to be a furoncle. The posterior spiracles of the maggot showed, however, like a "black head" through an opening in the center of the swelling. The maggot was fully alive after removal. As now preserved in alcohol, it is 15 mm. long, 8 mm. wide and 6 mm. thick. The patient's living conditions are described as of a very low order, as he is more often drunk than sober. This may give a clue as to how the unusual infection was acquired.

The genus *Cuterebra* is restricted to the New World, where it is represented by many species attacking a variety of wild mammalian hosts and occasionally certain domestic animals.¹ Three species are definitely known to occur in New England, and more particularly in Massachusetts. While the specific larval characters of most species are as yet imperfectly known, this is fortunately not the case for our three local species. These may be readily separated by means of the descriptions and figures recently published by E. F. Knipling and A. L. Brody (1940, Jl. of Parasitology, XXVI, pp. 33-43, 2 Pls.). The human maggot of Ware shows all the characteristic features of

¹ The generic name *Cuterebra* is here used in the broad sense, to include *Bogeria* and several other groups which have been separated from it in recent years.

the third instar of *Cuterebra buccata* (Fabricius) and I do not hesitate in referring it to this species. The posterior spiracular plates are shaped as in Knipling and Brody's Pl. I, fig. 2; while the spines, which cover the body fairly uniformly, are as shown in their Pl. II, fig. 9, with simple, sharp, moderately long, slanting points. The normal larval hosts of *C. buccata* are wild and domestic rabbits, in which animals the mature third instar maggot reaches 26 to 32 mm. in length, so that the larva removed from man was about half-grown.

In tropical America the maggot of the genus *Dermatobia*, a relative of *Cuterebra*, common in many types of mammals, has often been observed attacking man. A careful canvassing of the literature has, however, failed to disclose a previous case of human cutaneous myiasis due to *Cuterebra* either in North or in South America. F. C. Bishopp (1942, Proc. Ent. Soc. Washington, XLIV, p. 15) reported that a first instar maggot of an unidentified species of *Cuterebra* was removed from the nostrils of a person in Arlington Co., Virginia. This human case was also discussed by R. G. Beachley and F. C. Bishopp (1942, Virginia Med. Monthly, LXIX, pp. 41-42).

NOTES ON MAINE COLEOPTERA FOR 1945

By C. A. FROST
Framingham, Mass.

From the large piles of white pine planks at a saw-mill near South Paris, Me. the following rather uncommon species were taken: *Buprestis sulcicollis* Lec., *B. striata* var. *impedita* Say, three *Xylotrechus frosti* Van Dyke, four *Acanthocinus pusillus* Kby., a few *Chrysobothris harrisi* Hentz., *Monochammus titillator* Say, *M. confusor* Kby., *Enoclerus nigrifrons* Say, and many *Pissodes approximatus* Hopks. The very abundant species were: *Monochammus scutellatus* Say, *Chrysobothris dentipes* Germ., *C. scabripennis* Cast., *Enoclerus nigripes* Say, *Ips pini* Say and *Pityogenes hopkinsi* Sw. *Dendroctonus valens* Lec. and *Thanasimus dubius* Fab. were only occasional. On the under side of the scattered slabs and bits of boards were dozens of *Hylobius pales* Boh. which were also noted flying and one a captive of an *Asilid*. The time was from June 21 to July 6. Coleoptera have not been so abundant on lumber and logs since 1909 to 1912.

Podapion gallicola Riley. One specimen was taken either on the lumber or beaten from a red pine near the piles. I first took this species on June 29, 1930, at Wayland, Mass. by beating *Pinus rigidus* and have never taken it since in Mass.

Platysoma. Four specimens of an unknown species were taken at Paris, either on the under sides of the slabs or under white pine bark. It is related to *basale* Lec. but it is slimmer than the type and has the mesosternal marginal groove entire in front.

Eros humeralis Fab. A large colony of what appears to be this species was found under the bark of an old pine stump. They lack the usual yellowish humeral vittæ.

Orchestes canus Horn. The first record for this species from Maine is July 4, 1945. Four specimens have been taken at Framingham, Mass. and vicinity.

SOME NEW OR LITTLE KNOWN SOUTHERN SPIDERS

BY ELIZABETH B. BRYANT

Museum of Comparative Zoölogy

At the Museum of Comparative Zoölogy within the last two years many spiders have been received from Mr. George Nelson that were collected in Alabama and Florida. Among them were found the following species that are either new or known only from one sex. All are in the museum collection.

FAMILY OONOPIDAE

Genus *Philesius* Simon 1893*Philesius vernalis* spec. nov.

Female. Length, 1.6 mm., ceph. 0.4 mm., abd. 1.2 mm.

Cephalothorax bright brown, moderately convex, slightly granulate with a minute hair from each pit, anterior margin less than half the greatest width; *eyes*, a.l.e. largest of the six, separated by less than a radius, posterior row about the same length as the anterior row, straight, p.m.e. surrounded by black, a very broad oval, touching on the long diameter and separated from p.l.e. by about a line, p.l.e. smaller than p.m.e.; *clypeus* less than a diameter of a.l.e.; *labium* triangular, almost as long as broad; *maxillæ* inclined over labium, tips almost touching; *sternum* triangular, about two-thirds as wide as long, truncate between IV coxæ, all coxæ globose; *abdomen* pale, elliptical, half as wide as long, four-fifths of dorsum covered by an orange colored scutum, punctate, with a minute hair from each pit, venter with an orange colored scutum, that covers the basal two-thirds, also punctate with a hair from each pit, spinnerets closely grouped and not surrounded by a chitinous ring; *legs* paler than cephalothorax, no spines and very few hairs; *epigynum*, area swollen but showing no structure.

Holotype, ♀ Florida; Sebastian, March 1944, (Nelson).

The genus *Philesius* was based by Simon on a single species known from both male and female from St. Vincent. *Philesius marmoratus* the genotype, is much larger than *P. vernalis*. The genus is separated from *Gamasomorpha* which is widely dis-

tributed, by the ventral scutum shorter than the dorsal, and no chitinous ring about the spinnerets.

FAMILY PISAURIDÆ

Genus *Thanatidius* Simon 1898

Thanatidius tenuis (Hentz)

Figures 1, 6

Thomisus ? *tenuis* Hentz, 1847, p. 449, pl. 23, fig. 12; reprint, 1875, p. 82, pl. 10, fig. 12. "♀ Alabama."

Thanatidius tenuis Bishop, 1924, p. 18.

Male. Length, 14.6 mm., ceph. 5.5 mm. long, 4.0 mm. wide, an. margin, 2.0 mm., abd. 10.2 mm. long, 2.5 mm. wide at base, I leg. 42 mm. long.

Cephalothorax pale yellow, with a pair of narrow parallel darker stripes from p.m.e. to posterior margin, sparsely covered with short hairs, flat, thoracic groove very long and shallow, sides rounded and abruptly narrowed at region of posterior eye row to half the greatest width, an oblique row of bristles between lateral eyes and margin; *eyes* apparently in four rows, anterior row strongly procurved, eyes subequal, a.m.e. separated by slightly more than a diameter and from a.l.e. by fully two diameters, posterior row strongly recurved, slightly longer than anterior row, p.m.e. subequal with a.m.e., separated by fully two diameters, p.l.e. largest of the eight, slightly raised and directed backward, lateral eyes separated by about as much space as between p.l.e.; *quadrangle* of median eyes higher than wide and wider behind than in front; *clypeus* below a.l.e. less than a radius of a.l.e., a row of long bristles on margin of clypeus; *mandibles* vertical, pale, few long bristles near median margin, fang groove rather short, lower margin with three subequal teeth; *labium* white, longer than wide; *maxillæ* white, fully twice as long as labium, sides parallel; *sternum* white, flat, almost as wide as long, (4.0 : 4.5), with a few short bristles; *abdomen* a pale reddish-brown, very narrow, ending in a point above spinnerets, base bilobed, on sides a few dark dots, each bearing a short bristle, venter pale; *legs*, 1-2-4-3, all very long and slender; spines, I pair, patella, lateral, 2, tibia, ventral, 2-2-2-2-2, apical pair short, metatarsus, ventral, 2-2-2-2, all spines very long but not overlapping as in female; *palpus*, pale, not as long as cephalothorax, tibia longer than patella, but tibia

plus patella not as long as femur, tibia and patella each with a long dorsal spine, tibial apophysis very near distal end, a black, thin leaf-like projection, best seen in a lateral view, palpal organ very similar to *Thanatidius dubius* (Hentz), figured by Bishop and Crosby, 1936.

Allotype, ♂ Alabama; Silver Hill, July 1945, (Nelson); Additional specimens, ♀ Alabama; Silver Hill, July 1945, (Nelson); ♂ Alabama; Silver Hill, June 1945, (Krob).

The genus was based by Simon on *Thomisus* ? *dubius* Hentz and *Thomisus* ? *tenuis* Hentz, but as Bishop noted in 1924, unfortunately, Simon had a specimen of *Tetragonophthalma undulata* Keyserling instead of either of the two Hentz species. Bishop also erred in the number of ventral spines on the first and second tibiae. There are five pairs of ventral spines with the apical pair very short. In the female, the spines are long and over-lapping but in the male, the legs are so much longer that the spines do not over-lap. In 1924, Bishop in the revision of the Pisauridae described females of *Thanatidius tenuis* from Georgia, Florida and Louisiana.

FAMILY OXYOPIDÆ

Genus *Oxyopes* Latreille 1804

Oxyopes nelsoni spec. nov.

Figures 5, 7

Male. Length, 5.0 mm., ceph. 2.4 mm. long, 1.6 mm. wide, abd. 2.5 mm. long.

Cephalothorax yellowish, with wide slightly converging lateral dark stripes from p.l.e. to posterior margin, median area with vague dark marks, eyes surrounded by wide black rings, clypeus black, cephalothorax very high, widest between third coxæ, gradually narrowed anteriorly, thoracic groove long and faint, thoracic portion falls abruptly from groove; *eyes*, anterior row strongly recurved, a.m.e. very small, separated by a diameter, a.l.e. about twice the diameter of a.m.e. and separated from them by more than two diameters, posterior row longer than anterior, strongly procurved, eyes subequal and equidistant; *quadrangle* formed by a.l.e. and p.m.e. slightly wider in front and higher than wide; *clypeus* not as high as quadrangle of median eyes, slightly convex; *mandibles* dark, vertical, cone-shaped, fang groove very short; *labium* brown at tip,

longer than wide; *maxillæ* one and a half times as long as labium, outer half black, narrow; *sternum* pale, with vague elongate dark marks opposite coxæ, nearly as wide as long, (3.0 : 3.5), ending in a sharp point between fourth coxæ; *abdomen* almost black with middle area paler, widest at base and tapering to width of spinnerets at tip, venter black; *legs* pale with a narrow ventral black stripe on femora, posterior femora with a ventral line of black dots parallel to black line, spines long and black, few trichobothria on ventral surface of femora near base; *palpus* black, not as long as cephalothorax, tibia slightly longer than patella, with a very large spatulate process with two small marginal chitinized teeth near base on ventral side, no chitinized lobe on base of cymbium to interlock with tibial process, cymbium covered with black hairs, almost as wide as long, (4:5), ending in a very slender tip.

Female. Length, 6.0 mm., ceph. 2.5 mm. long, 1.6 mm. wide, abd. 2.8 mm. long.

Cephalothorax same as in male, but clypeus pale with two dark lines from a.m.e. that continues the length of the mandibles; *eyes* same as in male but surrounding black rings narrower and area between eyes covered with short white hairs; *abdomen* with a wide median pale stripe, sides black, venter pale with two parallel dark stripes; *legs* same as in male, trichobothria very prominent on ventral surface of femora near base; *epigynum* with a wide hairy median lobe, with a rounded tip that does not reach fold, each side are chitinized areas which partly surround the transverse openings, anterior to openings but below surface are dark sacs.

Holotype, ♀ Florida; Sebastian, 1-8 April 1944, (Nelson).

Allotype, ♂ Florida; Sebastian, 1-8 April 1944, (Nelson).

Paratype, ♂ Florida; Sebastian, 1-8 April 1944, (Nelson).

In 1902, F. O. P.—Cambridge described in the Biol. Centr.-Amer., vol. 2, p. 344, *Oxyopes tibialis* from Guatemala. The description is very brief and the clypeus is described with "fine black line on each side that crossing the clypeus and running down the mandibles, and a narrow black line running down the anterior side of the femora of all four pairs of legs." The tibia of the palpus is figured with "a long conspicuous process beneath it, strongly and concavospatulate at the apex." The female of *Oxyopes nelsoni* has the black lines on the clypeus and mandibles, and the black lines on the femora but the tibial

process on the male palpus is much larger than is figured for *O. tibialis* and has two small teeth near the base and lacks the process on the cymbium.

Through the courtesy of Dr. H. Dietrich of Cornell University, I have been able to examine the holotype female and the allotype male of *Oxyopes aglossus* Chamberlin from Billy's Island, Okefenokee Swamp, Georgia, collected by Dr. C. R. Crosby, June 1912. Figures (8, 10) are now given for comparison of the epigynum and palpus of this species. Both differ from *O. nelsoni*. The epigynum of *O. aglossus* is very distinct. The median lobe has a truncate tip and below is a darkened transverse band that apparently connects the two sacs beneath the surface. The tibial apophysis of the male palpus does not project at right angles as far from the tibia as is shown in the original figure and on the ventral side there is a rather slender branch with an anterior tooth that is set at right angles to the tibia. The original figure was from the dorsal side and shows only the process and the interlocking process on the cymbium. It is not impossible that the figure was drawn from another specimen and may be another species.

FAMILY THERIDIIDÆ

Genus *Emertonella* gen. nov.

Cephalothorax low and flat, as wide as long, thoracic groove very short; *eyes*, both rows recurved, a.m.e. largest of the eight, lateral eyes touching; *quadrangle* of median eyes wider than long; *clypeus* higher than quadrangle; *mandibles* vertical and weak; *labium* wider than long; *sternum* as wide as long, prolonged between fourth coxæ in a truncate lobe; *abdomen* oval, dorsum thickened, venter with a large epigastric scutum that surrounds the pedicel and a large infra-mammillary scutum, both can be seen from dorsal side; *legs*, 4-1-2-3, differing little in length; *palpus* with a short straight embolus, parallel to the conductor. Female unknown.

Genotype: *Emertonella emertoni* (Bryant).

The genus *Emertonella* differs from the genus *Histagonia* Simon, 1894, by the sternum extending between the posterior coxæ, by a faint dorsal scutum and the well defined scutum around and anterior to the spinnerets; from the genus *Paidisca* Bishop and Crosby, 1926, by the faint dorsal scutum, by a large

ventral scutum that includes the spinnerets and the absence of a stridulating organ between the abdomen and the cephalothorax.

Emertonella emertoni (Bryant)

Euryopis emertoni Bryant, 1933, p. 1, fig. 1. "♂ Georgia; Thompson's Mills, (Allard), Banks Coll."

Euryopis spinigera Emerton, 1924, p. 143, figs. 4, a-d nec *Euryopis spinigera* O. P.-Cambridge, 1895, p. 146, pl. 19, fig. 2.

Male. Length, 1.8 mm., ceph. 0.7 mm., abd. 1.1 mm.

Cephalothorax low and flat, as wide as long, anterior margin very little narrowed, thoracic groove short, a group of short erect hairs arranged in a diamond pattern anterior to the groove; *eyes* heavily ringed with black, cover anterior margin, anterior row recurved, a.m.e. convex, largest of the eight, separated by less than a diameter, almost touching a.l.e., posterior row very slightly recurved, lateral eyes touching, p.m.e. separated by about a diameter and from p.l.e. by a radius; *quadrangle* wider than long, wider in front than behind; *clypeus* higher than quadrangle; *mandibles* vertical and weak; *labium* wider than long; *maxillæ* twice as long as labium and inclined; *sternum* pale, as wide as long, convex, tip prolonged between coxæ as a truncate lobe; a row of hairs about margin directed inward; *abdomen* pale gray, the color ending abruptly on the sides, oval, more than half as wide as long, (5.0 : 7.0), with many long stiff hairs, each from a dark granule, two pairs of muscle spots, venter almost covered by an epigastric and inframammillary scuta, the anterior margin of the former can be seen on the dorsum and extends to the middle of the venter, the inframammillary scutum almost reaches the middle of the venter and dorsally covers the constricted tip of the abdomen, several small chitinated spots on sides and between the two large ventral scuta, posterior half of the venter with numerous long hairs, each from a pit, hairs not as long as those on the dorsum; *legs*, 4-1-2-3, pale, with distal joints darker, no spines and few hairs, a tarsal comb on IV tarsus of six stiff bristles; *palpus* not as long as cephalothorax, pale, with terminal joint much darker, patella and tibia short and broad, terminal joint broad, embolus at tip, a short straight spine, parallel to the large conductor.

This species was briefly described and figured by J. H. Emerton in 1924, as *Euryopis spinigera* O. P.-Cambridge, 1895.

Emerton examined three specimens, all males from widely separated localities, Chatham, Massachusetts, Charleston, South Carolina, and Riverhead, Long Island, New York. The first two specimens are in the Emerton Collection and the last in the C. I. Crosby Collection at Ithaca. Within a few years, the species has been found in Alabama and Oklahoma. A careful examination shows several characters that were not mentioned in the Emerton description.

Emertonella emertoni differs from the genus *Euryopsis* by the very short thoracic groove, the two large ventral scuta, the numerous long stiff hairs on the dorsum. The two pairs of muscle spots on the dorsum are very conspicuous in this species.

FAMILY ARGIOPIDÆ

Genus *Theridiosoma* O. P.—Cambridge 1879

Theridiosoma nelsoni spec. nov.

Figure 4

Female. Length, 1.5 mm., ceph. 0.6 mm., abd. 1.0 mm

Cephalothorax pale, head high; *eyes* about cover anterior margin, each eye heavily ringed with black, anterior row re-curved, eyes subequal, a.m.e. diurnal, touching, posterior row procurved, p.m.e. largest of the eight, angular, touching, lateral eyes subequal and touching; *quadrangle* higher than wide and wider behind than in front; *clypeus* about as high as quadrangle; *mandibles* pale, vertical; *sternum* pale, dark about margins, not quite as wide as long, tip very broad and continued between the fourth coxæ as a broad lobe, convex, with many dark hairs; *abdomen* pale, with a narrow transverse silvery band about the middle that is broken on median line, oval, base high and extending over cephalothorax, a few short hairs on dorsum, venter pale gray; *legs* short and varying little in length, pale with rows of dark hairs; *epigynum*, area convex and slightly protruding from the venter, anterior margin very long, with area below very narrow, a broad median septum with dark areas each side.

Holotype, ♀ Alabama; Alexander City, 1-14 August 1944, (Nelson).

Theridiosoma nelsoni is much smaller than the two other species found in the United States. *Theridiosoma radiosum* McCook is found abundantly in the eastern part of the United

States. The p.m.e. do not touch, the abdomen is covered with a brown net work and the epigynum has a large chitinized hood that protrudes from the venter and shows a triangular opening below. *Theridiosoma argentatum* Keyserling was described from an immature male from Georgia. The cephalothorax is 0.8 mm. long and the abdomen, 2.2 mm. long, with silvery spots and a brown net work, this is shown in the figure of the entire spider but the figure of the eyes is undoubtedly wrong as the a.m.e. are the largest and neither the anterior or the posterior median eyes touch.

Theridiosoma nelsoni is probably the species figured by Dr. Archer, 1941, p. 18, pl. 1, fig. 4, as *Theridiosoma argentatum*. He describes it in life as "a minute spider — a red abdomen with a conspicuous transverse band across the middle. The red fades to greyish in alcohol." Unfortunately he gives no measurements but mentions several places in Alabama where it is found. The figure of the epigynum agrees fairly well with *Theridiosoma nelsoni*.

FAMILY GNAPHOSIDÆ

Genus *Sergiolus* Simon 1891

Sergiolus meretrix Chamberlin

Figure 3

Sergiolus meretrix Chamberlin, 1922, p. 153. "♂ North Carolina; Raleigh."

Sergiolus meretrix Kaston, 1945, p. 4, figs. 13, 22-24.

Female. Length, 5.3 mm., ceph. 2.5 mm. long, 1.5 mm. wide, abd. 3.0 mm. long, 1.5 mm. wide.

Cephalothorax yellow with scattered long dark hairs, moderately convex, anterior margin narrowed to about one-third greatest width, thoracic groove very short and faint at posterior third; *eyes* cover middle two-thirds of anterior margin, anterior row straight, eyes subequal and equidistant, a.m.e. diurnal, separated by about a diameter, posterior row longer than anterior row, recurved, eyes subequal, p.m.e. little nearer to p.l.e. than to each other; *quadrangle* narrower in front and higher than wide; *clypeus* narrow, about equals diameter of a.m.e.; *mandibles* yellow, with many long black bristles, vertical, cone-shaped; *labium* yellow, longer than wide, tip pointed; *maxillæ* yellow, twice as long as labium, strongly impressed, tips trun-

cate and black, *sternum* pale yellow with many black hairs, convex, three-fifths as wide as long, fourth coxæ separated by half a diameter; *abdomen* oval, black with three transverse bands of white hairs, the basal band widest and broken at the middle, the median and distal bands narrower and connected at the ends, venter black with a vague U-shaped stripe, spinnerets long, ventral pair widely separated; *legs*, 4-1-3-2, a darker yellow than the cephalothorax, no dark rings, very few spines, I and II tibiæ, dorsal, 0, ventral, 1 at tip, I and II metatarsi, dorsal, 0, ventral, 1 at base, III tibia with a dorsal median spine, IV tibia, no dorsal median spine; *epigynum*, area wider than long, a pair of transverse oval depressions with heavily chitinized margins, each with two pits, near the slender septum, one pit above the other.

Male. Length, 4.5 mm., ceph. 2.2 mm., abd. 2.3 mm. (Type).

Cephalothorax more slender than in the female; *eyes*, *mouth parts* and *sternum* as in the female; *abdomen* has been rubbed so that the white hairs on the basal band and the middle of the median band have disappeared, as well as the black hairs that cover the rest of the dorsum, showing a wide distinct scutum from the base to the white band near the tip, the posterior margin truncate, venter gray with wide pale lateral stripes; *legs*, I pair missing, III tibia with a strong dorsal median spine, IV tibia, no dorsal median spine; *palpus* shorter than cephalothorax, patella and tibia about as long as the diameter of the joint, tibial apophysis as long as the diameter of tibia, narrowing rather abruptly with the margins of the distal half parallel, with a recurved hook at the tip.

Holotype, ♂ North Carolina; Raleigh, (Brimley).

Allotype, ♀ Alabama; Alexander City, 1-14 August 1944, (Nelson).

Additional specimen, ♂ Alabama; Silver Hill, September 1945, (Nelson).

Sergiolus meretrix Chamberlin is separated from *S. variegatus* (Hentz), found in the same area, by the broader transverse bands of white hairs on the abdomen and by the secondary characters. In the male of *S. meretrix* the scutum almost covers the dorsum, the tibial apophysis of the palpus is more slender and the sides of the distal half are almost parallel; in *S. variegatus* the scutum covers about one-half the dorsum and the sides of the tibial apophysis are not parallel. The difference is as

great between the females of the two species, in *S. meretrix* the median septum of the epigynum is very narrow and the depressed areas are elongate, while in *S. variegatus* the septum is much wider and the depressions are nearly circular. Unfortunately, the specimen of *S. variegatus* figured by Mr. Emerton, 1890, pl. 4, fig. 1, probably lacks more than one moult of being adult.

FAMILY CLUBIONIDÆ

Genus *Clubiona* Latreille 1804

Clubiona procteri Gertsch

Figure 9

Clubiona procteri Gertsch, 1941, p. 10, figs. 17, 18. "♂ Indian Town, Florida, 28 March 1938."

Female. Length, 4.5 mm.

Cephalothorax typical; *eyes* seen from above, anterior row slightly recurved, eyes equidistant and subequal, posterior row slightly longer than anterior, eyes subequal, p.m.e. separated by fully two diameters and from p.l.e. by more than a diameter; *quadrangle* of median eyes narrower in front and wider than high; *clypeus* very narrow, less than a radius of a.m.e.; *mandibles* pale brown, geniculate, lower margin of fang groove with two teeth; *epigynum*, chitinized area longer than wide, posterior margin deeply notched, openings oblique, area between convex, spermatheca in anterior portion of area, separated by less than a diameter.

Allotype, ♀ Alabama; Silver Hill, July 1945 (Nelson). Additional specimens, ♂ Alabama; Silver Hill, July 1945. (Nelson). ♂ North Carolina; Raleigh, 5-10 June 1943, (Brimley). ♂ Florida; Wabasco, 25 April 1944, (Nelson).

FAMILY SALTICIDÆ

Genus *Habronattus* F. O. P.—Cambridge 1901

Habronattus trimaculatus spec. nov.

Figure 11

Male. Length, 4.0 mm., ceph. 2.1 mm. long, 1.5 mm. wide. abd. 2.0 mm. long.

Cephalic plate black, with three pale spots, median spot largest, lateral spots elongate, posterior margin of the darkened area deeply emarginate, a posterior median black spearmark

that reaches line of dorsal eyes, area each side bright yellow, a wide lateral dark spot each side, margins yellow, a fringe of long dark hairs above anterior eye row, widest between second pair of legs, sides almost parallel, cephalic portion high, thoracic falling abruptly on posterior two-fifths; *eyes*, anterior row straight by upper margins, a.l.e. about half a diameter of a.m.e., eyes of second row very small, and nearer first than third row, eyes of third row on margin, eye area occupies about one-third of carapace; *quadrangle* as wide behind as in front; *abdomen* black with a narrow pale basal band that extends on sides, a narrow median pale stripe which does not reach either end of abdomen, and two short oblique pale bars from the sides that extend only a short distance on the dorsum, a pair of widely separated white dots above the spinnerets, venter pale with three dark stripes; *legs*, 3-4-1-2, pale, with distal joints darker, third leg not modified and no fringes on first pair, spines, I pair, patella, prolateral, 1, tibia, ventral, 2 distal, followed by 1 prolateral, 1-1 retrolateral, metatarsus, ventral, 2-2, twice the diameter of the joint, II pair, spines same as on I pair but smaller, III pair, femur, ventral, at distal end, short prolateral and retrolateral rows of long stiff bristles, (may be trichobothria), no ventral median spine on tibia; *palpus*, femur pale, tibial apophysis a very slender black spur with tip constricted in an out turned hook, palpal organ typical, with inner process starting about the middle and ending about half way on the side, outer process staring on side above the tibial apophysis, following the contour of the cavity and ending at the tip, more slender than the inner process.

Holotype, ♂ Florida; Sebastian, 1-7 April 1944, (Nelson).

The type and an immature male and female were collected at Sebastian, Florida in April by Mr. Nelson, probably by beating. All have the same markings. The species is related to *Habronattus delectus* (Peckham), known only from the type material of two males and a female found at Austin, Texas. It is separated from that species by the slightly larger size, darker legs, different spining of the first tibia and the tibial apophysis of the male palpus. Both have the three spots of white hairs in the eye area, a rather unusual character in this genus, but the posterior margin of the dark area between the dorsal eyes of *H. delectus* is transverse, while in *H. trimaculatus* it is deeply emarginate, and the tibial apophysis of *delectus* is broadly trun-

cate. It is separated from *H. tachypoda* Chamberlin and Ivie, 1944, found at Briar Creek, near Sylvania, Georgia, by the three white spots on the ocular area, the lack of modified hairs and bristles on the first tarsus, and the tibial apophysis.

Genus *Marpissa* C. Koch 1846

Marpissa rupicola (Hentz)

Figure 2

Attus rupicola Hentz, 1846, p. 357, pl. 21, fig. 14; reprint, 1875, p. 61, pl. 8, fig. 14. "♀ Alabama, September."

Female. Length, 10.5 mm., ceph. 4.5 mm. long, 3.5 mm. wide, abd. 6.0 mm. long, 3.5 mm. wide.

Cephalothorax darkest about the eyes, two converging dark stripes from p.m.e. to posterior margin, with area between pale, quite flat, sides rounded, widest between second and third coxæ, thoracic groove distinct; *eyes*, first row covers entire anterior margin, strongly recurved, a.m.e. almost touching and twice the diameter of a.l.e., eyes of second row slightly nearer first than third row, eyes of third row subequal with a.l.e., but convex; *quadrangle* same width in front as behind, a long bristle below each p.l.e.; *clypeus* about wanting below a.m.e.; *mandibles* brown, with many long white hairs, vertical, not swollen, fang groove short, upper margin with two teeth, one nearer base of fang larger, lower margin with one tooth, fang short with a thick base; *labium* more than twice as long as wide; *maxillæ* brown, almost twice as long as labium, tip widened; *sternum* about two-thirds as wide as long, narrower than labium at anterior end and ending in a rounded point in front of the fourth coxæ, widest between second and third coxæ; *abdomen* oval, quite hairy, dorsum flat, with a pale median stripe less than one-third the width of the abdomen, the pale stripe abruptly widened before the middle, the distal half bordered by dark stripes, a pair of small white dots above the spinnerets, sides mottled with dark, venter pale with dark dots; *legs*, 4-3-1-2, anterior pairs slightly enlarged, pale with ends of joints darker, spines, I pair, patella, 1 small prolateral, tibia, dorsal, 0, ventral, 2-2-2, distal, median and basal, spines of prolateral row larger, prolateral, 1-1, retrolateral, 0, metatarsus, dorsal, 0, ventral, 2-2, lateral, 0, II pair same as I pair, posterior pairs with many spines; *epigynum* large, chitinized area longer than

wide, a strongly chitinated excavate lateral openings on anterior half, a median raised ridge on posterior half sloping to depression on each side, the depressions separated by about a diameter.

Neotype, ♀ Alabama; Silver Hill, July 1945, (Nelson).

Hentz had both male and female of this species but he figures the female only. He states that it was found in cavities of limestone rocks on the margin of a river and describes it as rufous and hairy. The figure shows the median pale stripe on the dorsum much narrower than in *undata*, (*familiarius* Hentz), found about houses. Mr. Peckham examined the specimens identified by Mr. Banks as *rupicola* from Ithaca, New York and Falls Church, Virginia, and found them to be only color varieties of *undata*. On examining these specimens, the epigynum proves to be the typical *undata*. It was Mr. Banks who first recognized this specimen as *rupicola* Hentz.

Marpissa melanura F. O. P.—Cambridge described from a female from Guatemala City, (Biol. Centr.-Amer., 1901, 2 : 251, pl. 22, fig. 7), also has excavations on the sides of the epigynum but the pale median stripe on the dorsum is quite broad and it has no indications of the pale cross bars near the spinnerets. This species has been placed by Peckham as a synonym of *M. californica* (Peckham).

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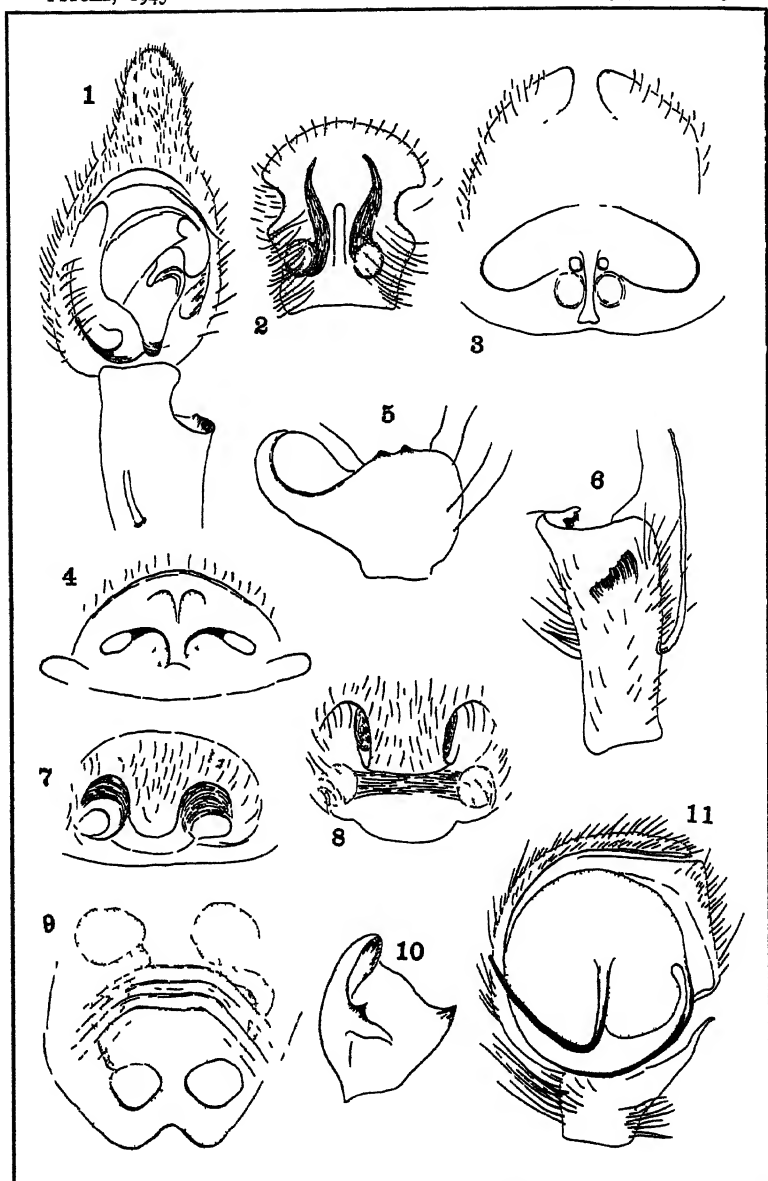
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EXPLANATION OF PLATE 15

- Fig. 1. *Thanatidius tenuis* (Hentz), left palpus, ventral.
Fig. 2. *Marpissa rupicola* (Hentz), epigynum.
Fig. 3. *Sergiolus meretrix* Chamb., epigynum.
Fig. 4. *Theridiosoma nelsoni* spec. nov., epigynum.
Fig. 5. *Oxyopes nelsoni* spec. nov., tibia of left palpus, ventral.
Fig. 6. *Thanatidius tenuis* (Hentz), tibia of left palpus, lateral.
Fig. 7. *Oxyopes nelsoni* spec. nov., epigynum.
Fig. 8. *Oxyopes aglossus* Chamb., epigynum.
Fig. 9. *Clubiona procteri* Gertsch, epigynum.
Fig. 10. *Oxyopes aglossus* Chamb., tibia of left palpus, ventral.
Fig. 11. *Habronattus trimaculatus* spec. nov., left palpus, ventral.



A THIRD SPECIES OF *ECHINARGUS* NABOKOV (LYCAENIDAE, LEPIDOPTERA)

By V. NABOKOV

Museum of Comparative Zoölogy

Since discussing the neotropical *Plebejinae* (Mar.-June, 1945 [publ. 26-X.1945] *Psyche* 52: 1-61), I have examined a male of "*Lycaena*" *martha* Dognin 1887 (*Le Naturaliste* 9: 190, fig. 5) kindly loaned to me by Prof. Wm. T. M. Forbes. The species proves to belong to my genus *Echinargus* and structurally is beautifully intermediate between *isola* and the Trinidad species. The specimen is labeled "Huacapistana, Rio Tarma, Peru, 1-3-VI-1920, [*leg.*] T. M. Forbes," coll. Cornell U.

Measurements (in mm.): aedeagus 0.79, suprazonal portion 0.3, subzonal 0.49, with breadth (lateral view) 0.1; penis 0.67;

furca 0.5; sagum 0.52 (see description). $\frac{\text{Vertical}}{\text{Horizontal}}$ extension of
uncus: forearm $\frac{0.26}{0.04}$, humerulus $\frac{0.06}{0.19}$, shoulder $\frac{0.16}{0.08}$, lobe

$\frac{0.24}{0.07}$. Valve 0.87, with breadth 0.39.

Sagum intermediate between *isola* and the Trinidad species: smaller than in the former, with an "unfilled" portion in the ventral margin as in the Trin. sp., and larger than in the latter, with the "unfilled" portion much less pronounced and armed with teeth as in *isola*; if measured as in the case of the Trin. sp. (*l.c.*:30) then ZD = 0.52, PD = 0.4, and ZP = 0.45, the jutting "lower portion" being only 0.16 (i.e. about twice shorter than in the Trinidad species) along its "upper" margin, and some of the teeth (the medial ones) with which the side ZD is set (about a dozen in all) reaching almost 0.1 in length.

I take this occasion to note that in *Pseudothecla faga* Dognin the rudimentary sagum (*l.c.*:11) clings to the furca and is armed with numerous minute teeth averaging 0.014 in length. (A certain roughness suggesting rudimentary teeth is also apparent under a $\times 360$ magnification in the small sagum lobe of *Hemiargus hanno*).

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